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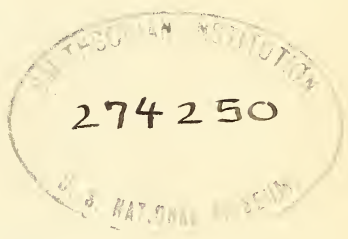
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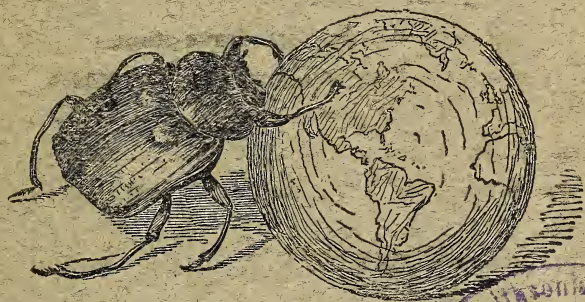
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JOURNAL

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VOL. XXXII.

MARCH, 1924.

No. 1

CRITICAL OBSERVATIONS IN THE MEMBRACID GENUS *CYRTOLOBUS* GODING. (HEMIP.-HOMOP.)

BY LEWIS B. WOODRUFF,

NEW YORK CITY.

Since the publication in 1908 of Mr. Edward P. Van Duzee's most useful "Studies in North American Membracidæ"¹ nothing has appeared of a systematic character concerning our representatives of the genus *Cyrtolobus*, other than one or two brief papers correcting or modifying certain conclusions there presented, or for purposes of local lists. Contemplating the preparation of as complete a review of this genus as might be practicable, I have devoted much time to field work and study during the past three years in an attempt to solve the many problems which have presented themselves as the work proceeded. Considerable progress has been made; but so many unforeseen difficulties have arisen, including the discovery of undescribed species in every locality visited, with the resulting presumption that our knowledge of its components is far from complete, that it has become apparent I cannot yet offer such a review as would be satisfactory. Nevertheless certain results already attained, particularly with respect to species of the eastern United States, will be of value and interest to other students of the group; so I am impelled to formulate them now, that they may be made available. It is to be hoped, however, that the preparation of such a review by a competent authority may be warranted and prove feasible within a reasonable time.

¹ Bull. Buf. Soc. Nat. Hist. IX, p. 29. (1908).

In setting forth the characters of those species which heretofore have not been recognized, as well as of the undescribed males of species of other authors, but little reference is made by me to facial outline or pronotal punctuation, due to my inability to discover sufficient stability in these characters to render them of more than questionable value in specific diagnosis. For the delineation of the species treated I have been fortunate in securing the services of Mrs. Beutenmuller. It should be pointed out, however, that the figures are intended to portray in the respective species represented only the form and pattern of the pronotum, with the character of the infuscation of the fore wings, and that neither the texture of the latter, the form of the abdomen visible in nature through their hyaline area, nor the details of coloring, vestiture and structure of the legs are intended to be indicated.

Acknowledgment is here made to the custodians of the material in the collections of the United States National Museum, American Museum of Natural History, Boston Society of Natural History, New York State Museum at Albany, and Brooklyn Museum of Arts and Sciences, as well as to Messrs. W. T. Davis, C. E. Olsen, W. D. Funkhouser, Charles S. Johnson, and Mrs. Annie Trumbull Slosson for the privilege of examining what in the aggregate proved to be a most interesting array of the forms to be found throughout the continent north of Mexico, and which also emphasized the extreme confusion of the genus so far as the recognition of described forms is concerned. To Dr. Funkhouser in particular I am indebted for most helpful criticism and discussion, both by correspondence and through charming hospitality extended to me at his most delightful home.

As it is a prerequisite to a correct understanding of the genus that those species already described be certainly recognized, I shall not only present my conclusions with respect to the identity of those regarding which there seems to be any confusion, but somewhat in detail the steps by which I have reached such conclusions.

The order in which my consideration of the several species is presented conforms for the most part to that followed in Van Duzee's List of the Hemiptera of America north of Mexico, such comparatively few departures or transpositions as I have made

in the sub-genus *Cyrtolobus* s. str. being in the interest of what seems to me a closer approximation to their natural sequence from the species in *Archasia* and *Smilia* to those in *Atymna*.

Cyrtolobus ovatus Van Duzee.

Cyrtolobus ovatus Van Duzee was described from female specimens only. Its color, given as "soiled yellowish testaceous" in the dried specimen, is accurate for the living specimen as well; but occasional examples are taken that are pale green. There is frequently present, too, a sub-obsolete anterior oblique vitta, with more or less obscure indications on the dorsal carina of the translucent spot and anteapical vitta. Its deflexed posterior pronotal process fully attains the apex of fore wings. The male, hitherto undescribed, seems to be of two color forms, one black and the other pale brownish. The latter may be described as follows:

***Cyrtolobus ovatus* Van Duzee. (Plate V, Fig. 41.)**

MALE: Pronotal arch much less arcuate than in the female, only slightly deflexed at tip and attaining only to middle of terminal areole. Mid-dorsal compression deep and very pronounced. Color light brown, somewhat shining, becoming a little reddish back of anterior oblique vitta. The latter is white, arises from middle of lateral margin and curves forward only about half way to crest. Translucent spot at mid-dorsal carina small. Anteapical white vitta complete, vertical, prominent.

Body beneath pale.

Fore wings sub-hyaline, slightly clouded at terminal margin.

Legs pale, femora above a little darker.

Length 4 mm.

Allotype ♂. Lakehurst, N. J. VI/17/'17. In my collection. Taken on *Quercus ilicifolia*

This brown form I have taken, probably while copulating, with a female from a very small sapling of *Quercus minor* at Hazen, Alabama, the sapling so small it could hardly have harbored another species. The black form, also taken at Lakehurst, N. J., and in the south, is the counterpart in form and markings of the brown one, jet black replacing the brown, including the body beneath and femora above, the black throwing into greater relief the white vittæ. The brown male is here figured.

Cyrtolobus arcuatus Emmons.

Cyrtolobus arcuatus Emmons is one of the least abundant species in the genus, though occurring both north and south in the eastern United States. Emmons's published figure shows well the form of the female, though of rather unusual coloring, the nearest approach to which that I have seen is a specimen from Massachusetts in the C. W. Johnson collection. A series of nine female specimens taken by me in Alabama range from no vitta to a strongly marked anteapical whitish vitta, quite broad, bordered anteriorly with a narrow dark band, sometimes rather rufous; the pronotum otherwise brownish testaceous, three of them peppered with black anteriorly and along dorsal crest. At Yaphank, Long Island, N. Y., I have taken four other females similarly marked, but much more contrastingly, the anteapical vitta broadly white, bordered both before and behind with narrow dark bands. At the latter locality four male specimens have been taken; in the American Museum of Natural History, New York City, is one from Berkley Heights, N. J., collected by the late E. L. Dickerson, and in the National Museum is one from Maryland, all of which I unhesitatingly place as males of this species. Hitherto the male has been unknown, and these six specimens are all I have seen. A description of that sex is as follows:

Cyrtolobus arcuatus Emmons. (Plate I, Fig. 3)

MALE: Pronotum arching moderately, very slender, no anteapical sinus, tip slightly deflexed as in the female, and almost attaining apex of fore wings.

Color dark testaceous, thickly irrorate with black on metopidium and forward part of pronotum. Anterior oblique pale vitta broad, the mid-dorsal translucent pale spot equally broad, directed from crest to bottom rearward and reaching that vitta at its middle. Immediately back of this translucent spot; only narrowly separated from it, commences an even broader anteapical vitta, inclined strongly rearward from dorsal to lateral margin, generally paralleling the direction of the elongated translucent spot.

Body beneath dusky.

Fore wings hyaline; apical border infuscated.

Legs yellowish testaceous, shining.

Length 5.8 mm.

Allotype ♂, Yaphank, Long Is., N. Y. VI/9/'12 (W. T. Davis), in my collection.

Accompanying the figure of the male specimen above described is appended that of a female (Fig. 4) taken by me at the same locality June 15, 1923. It will be noted that its anteapical vitta has an inclination approaching that of the male, though not so pronounced—an inclination not found, at least in similar degree, in any other species of the genus known to me. While the male has not yet been taken in copulation, I have no doubt that the specimens above described are correctly assigned to this species, by reason of their corresponding general facies.

Cyrtolobus fuliginosus Emmons.

In 1854 Emmons figured a species of *Cyrtolobus*, with a very brief description,¹ under the name *Cyrtosia fuliginosa*. There seems to be no confusion as to its identity—very dark, the markings often obscured, with a distinctive pronotal structure, its apex, slightly deflexed, almost or quite attaining that of the fore wings, with a slight anteapical sinuation usually faintly indicating a clear spot on the dorsal carina. The mid-dorsal translucent spot, however, is lacking. Such is Emmons's *fuliginosus* of the female sex. It is frequently almost black. Occasionally, however, specimens are found that show on this blackish surface more or less evident markings, including the pale oblique vitta which occurs so often throughout the genus; but almost always the anteapical vitta is lacking. From these it is but a step to still paler specimens through various shades of brown, reddish and pink. The latter forms are found much more frequently than the blackish unmarked ones, though in the same localities, and in almost all collections to which I have had access they bear names of various species assigned to this genus, but in no case that of the species figured by Emmons above referred to. The specimen in the Harris collection at the Boston Society of Natural History Museum which bears Say's identification as his *vau* is one of these pale forms. In structure, however, they seem to me absolutely indistinguishable from that of *fuliginosus* Emm., and I have no doubt that these paler forms are of the same species.

Its distribution seems to be general throughout the eastern United States. In Alabama I have found the reddish or pinkish

¹ Nat. Hist. of N. Y., Agri. V., p. 154; Plate 13, Fig. 15.

form to the exclusion of the blackish one; and there succeeded in getting a pair in copulation, thus definitely ascertaining the identity of the male of this species, hitherto not positively known. Figures of this pair are presented with this paper, the male of which is described below in detail and designated as the allotype of the species. It will be noted that this male is prevailingly black, as are some twenty other specimens of this sex collected with these reddish females in the same locality. Four reddish males in my collection, also taken with them, as well as similar specimens examined by me from various parts of the country, north and south, I regard as the same species; and as the blackish male is found with the reddish female, even copulating with it, not even racial standing can be given the conspicuously different color phases found in both sexes of this species.

***Cyrtolobus fuliginosus* Emmons.** (Plate II, Figs. 13, 14.)

MALE: In form like the female, but smaller, the low and slender pronotum not attaining apex of fore wings.

Face deep, margins of genæ rounded so that contour of face is almost semicircular, with clypeus very little produced.

Metopidium rising vertically from base in a plane with and exceeding in height that of face, thence abruptly back at an interior angle of about 120° to the summit of the crest forward of middle, with a very slight sinus over humeri, thence sloping to apex, which barely exceeds basal angle of terminal areole of fore wings, a strong but hardly translucent mid-dorsal compression, and a slight sinus at anteapical vitta. Face, metopidium and whole of pronotum anterior to oblique vitta black densely irrorate with pale testaceous. Anterior oblique vitta whitish testaceous, arising at the side margin back of the middle, arching gradually forward to above post-humeral sinus and thence rising abruptly and vertically to dorsal carina. The posterior vitta vague, vertical, whitish testaceous interrupted by the brownish black pigment of the pronotum, which is almost uniform back of the anterior vitta except where crossed by this posterior vitta. Mid-dorsal compression slightly reddish.

Body beneath black, abdominal ventral segments pallid.

Fore wings slightly enfumed, not so much as in the female, margin narrowly fuscous.

Legs pale testaceous.

Length 5.20 mm.

Allotype ♂, Hazen, Ala. IV/6/'21. In my collection.

The above described male was taken with a female *in copula* on *Quercus rubra*. Specimens of this sex before me range from almost wholly black to those in which the black pigment is greatly reduced. There seems to be no intergradation, however, between the blackish forms and those in which pink or red replaces the black. In all the forms the anteapical vitta in this sex is usually pronounced, often extremely broad; in the reddish form it shows a greater tendency to be obsolete as in the female.

Cyrtolobus acuminatus new species.

The following new species is one that should be recognized readily when found by its contrasting whitish and red pronotum with its acuminate posterior process. In an orderly arrangement of the genus it perhaps finds its place near *fuliginosus* Emmons, though not so decidedly arcuate, the form of its pronotum, particularly as respects the often decurved apex, closely corresponding in that feature with the figure of that species given by him. But it is a little longer and proportionately lower, with more pronounced anterior sinus, and even brighter colored than the pale forms of that species, and its posterior pronotal process is decidedly slender and acute. Its supra-humeral bands suggest those of *discoidalis* Emmons; but, unlike that species, they do not extend down over the face, and the oblique vitta, though bordered behind at the lateral margin with black, does not extend so far to the rear. Its larger size, reddish posterior half, pale femora and strongly enfumed fore wings also distinguish it. The arch of the crest and attenuate pronotal apex recall *fenestratus*; but here again it is much larger, the arch between the carinal sinuses is not so abrupt, the mid-dorsal translucent spot is only slightly pellucid, the pronotal apex is usually definitely deflexed, and the strongly enfumed fore wings with their broad apical cloud are divergent characters. Figures of both sexes are herewith presented, and their description follows:

Cyrtolobus acuminatus, new species. (Plate VI, Figs. 47, 48.)

FEMALE: In size rather above the average; colors contrasting, creamy white anteriorly, red posteriorly; arch pronounced between anterior and posterior sinuses, apex of posterior process attenuate, usually decurved, no anteapical vitta, clypeus plainly produced, fore wings strongly enfumed.

Face creamy, shining, small punctures reddish brown, clustered adjacent to eyes and on front, spots at base above ocelli elongate vertical; clypeus with sutures strong, loræ outlined with reddish without and within, clypeus centrally strongly produced below line of cheeks at least as far again as length of loræ, seemingly variable in width, tending to comparatively narrow, very little incurved.

Pronotum rising vertically in plane of face about twice as high as is middle of post-humeral sinus, thence rounded back almost horizontally to above humeral angles, where it begins a pronounced arch to posterior sinus. its highest point before middle. From the latter sinus the posterior process is attenuate, prolonged, very sharp at its apex and usually, but not always, rather strongly deflexed, attaining or exceeding apex of terminal areole of fore wings. Punctures of surface back of oblique vitta are large and deep, the surface reticulate. Metopidium and pronotum anterior to oblique vitta creamy white, with narrow reddish brown bands arising at black or red callosities above eyes and surpassing humeri, but more or less lost thereafter. Oblique vitta rising from lateral margin just back of mid-dorsal translucent spot to a point a little anterior to that spot, its rear margin surpassing its base, thence horizontally forward to above posthumeral sinus, where its rear margin often turns abruptly to carina, its front margin reaching carina at anterior sinus. The anterior margin of this vitta is very poorly defined, except at the lateral margin of the pronotum, by reddish punctures much interrupted by the cream colored surface of the forward parts. The vitta itself is cream colored, extends narrowly forward along lateral margin, and is bordered behind by the red of the posterior surface of the pronotum, along its lower half by darker red tending to blackish. The crest is very narrowly thinned back of anterior sinus and along posterior sinus, with a strong mid-dorsal compression containing a deeper than wide pellucid spot, on either side of which the carina is narrowly blackened. The anteapical vitta is lacking.

Body beneath black anteriorly, abdominal segments pale testaceous, the ninth bordering the ovipositor washed with red.

Fore wings sub-hyaline, strongly enfumed, the corium dark red to black, apex a little more intensely infuscated, covering terminal areole and half of adjacent cells, the anterior margin of cloud indefinite.

Legs pale testaceous, including femora.

Length 6.50 mm.

MALE: Like the female, but much smaller; in the allotype the clypeus is narrow and even more produced, exceeding the loræ by about twice their length, and is very hairy at its tip. Supra-humeral bands faint; posterior process of pronotum attenuate and very sharp, but not at all deflexed, attaining middle of terminal areole of fore wings. In a specimen cited below, whose coloring may prove to be the prevailing one, the cream and red of the pronotum are largely supplanted by black, with the pronotal apex white.

Body beneath, legs and fore wings as in female.
Length 5.60 mm.

Holotype ♀. Pine Island N. Y. VI/19/12 (W. T. Davis), in Davis collection.

Allotype ♂. Taken with holotype. In my collection.

Paratypes: Four females, taken with types, and a male and five females taken in northern New Jersey (E. L. Dickerson) in Coll. Am. Mus. Nat. Hist.

A male at hand from Berkley Heights, N. J. (VI/9/—), resembles in coloring, but not in form, the male of *muticus* Fab. in the sub-genus *Xantholobus*. Its face, base of metopidium, and shoulders are yellowish white, with black on front of metopidium from a little above base, filling in space between humeral bands, which are obliterated, and area between narrow pale lateral margin and oblique vitta, and also back of that vitta to posterior sinus, replacing red of allotype. Its posterior process is wholly creamy white, and its fore wings are clearer, though somewhat enfumed.

Thus far I have seen examples of this species from New York and New Jersey only, twelve in all. But that should not necessarily be taken to mean that it is rare; more likely that it is extremely local in its distribution. The female holotype is perhaps a little below the average in length, one specimen before me measuring 7.10 millimeters; and the posterior process of the pronotum is usually decidedly decurved, much more so than is shown in the figure given herewith. Its size and general color and pattern at once suggested to me Fairmaire's description of *sculptus*, ever present in my mind; but the absence of "two almost transparent dorsal spots" and its strongly enfumed fore wings bar it from that identification.

This species well exemplifies what seems to be the very plastic state of this genus, with the consequent difficulty in finding structural characters that in themselves will serve definitely to fix a species; for instance the clypeus of the female, here usually long, narrow and much protruded below line of cheeks, is in one specimen comparatively broad and but little protruded. And the degree of deflexion of the pronotal process from zero to extreme is another instance. The comparatively large size, creamy white

forward parts, and general facies, all serve to mark it out as distinct from other described species.

Cyrtolobus dixianus new species.

The following species, not heretofore recognized, in the female suggests *arcuatus* Emm., with which I have found it associated on its host plant, but it is at once distinguishable in the field by its green rather than grayish or testaceous color, and more particularly by its more moderate pronotal arch without apical sinus, and by the entire lack of the broad white anteapical vitta with its anterior reddish brown border, more or less pronounced in that species. The male is wholly dissimilar. Descriptions and figures of both sexes are herewith presented.

Cyrtolobus dixianus, new species. (Plate I, Figs. 5, 6.)

FEMALE: Much the form of *arcuatus* Emmons, but a little smaller. The acute posterior process of its pronotum, while reaching at least to apex of terminal areole, does not attain the apex of the fore wings as in that species. Color light green throughout; some specimens in life more or less washed with bright yellow, particularly on face and metopidium centrally and over humeri, and on sides of abdomen. As usual with green insects, this color often undergoes a change in drying specimens, becoming on the pronotum a tan shade which more or less completely, though rarely entirely, usurps the original green, and on the face and softer parts tends toward a pale yellow.

Face between eyes but little broader than long, margins of genæ strongly sinuate, again incurving to the distinct clypeal sutures, their outline therefore not continuous with that of clypeus; the latter very slightly inflexed, moderately produced and rounded. Eyes green, centrally reddish brown.

Pronotum moderately arched, highest just before middle, carina curving evenly without sinuses to apex, where it meets the rectilinear side margins undeflexed; the whole crest bright green, flecked with small pale green or white impunctate spots becoming creamy white in dried specimens. and covered inconspicuously with fine, erect and sparsely placed hairs. Punctuation not very coarse, punctures regular in size, evenly and fairly densely distributed.

Body beneath green.

Fore wings hyaline, their veins greenish and distinct; apex immaculate.

Legs green, claws rosy.

Length 7.5 mm.

MALE: Form similar to that of female, but arch much less pronounced; punctuation coarser and sparser, and surface consequently more shining.

Face green.

Pronotum anteriorly, including metopidium and forward part of crest, covering humeri and running diagonally to middle of lateral margins. bright green; back of this the crest is creamy white, with brown as follows. A small blotch on carina just forward of middle; a broad band from behind middle of dorsal carina running vertically to lateral margin; and another covering apex—the whole pronotum with the white flecking spots seen in the female.

Body beneath bright green. Tergum of abdomen black, the black in some specimens invading the green of the ventral segments. Genital organs black.

Fore wings hyaline without fuscous apical cloud, as in female; brownish coriaceous at extreme base.

Legs bright green.

Length 6.5 mm.

Holotype ♀. Hazen, Ala. IV/9/'21. Taken on *Quercus minor*.

Allotype ♂. Same locality, date and host plant. Both in my collection.

Paratypes: Nineteen males and thirty-eight females. Same locality.

The holotype and allotype were taken by me *in copula* by beating *Quercus minor*. Five of the paratypes were beaten from *Quercus phellos*, the rest from *Quercus minor*, the latter evidently the preferred host plant. In the National Museum collection is a female specimen from Maryland, in Dr. Funkhouser's collection one from Rochester, N. Y., which seem to be this species. and in Mrs. Slosson's collection is a pair taken in copulation at Delaware Water Gap, Pa. In Alabama I have found this species in comparative abundance on its host plant (*supra*) from April 5 to 13, 1921, and April 23 to May 4, 1923; and many more females might have been captured easily. Not so with the males, however. That sex was the most agile *Cyrtolobus* I have ever endeavored to cover with my hand in the inverted umbrella; and for several days upon first encountering them I despaired of securing a single specimen, as they took to flight almost instantaneously upon touching its surface. In 1923 they proved to be much less abundant in the type locality than in 1921; but the season was unusually late and cold, which doubtless accounts for their scarcity in that year

Cyrtolobus celsus Van Duzee.

Cyrtolobus celsus Van Duzee belongs to the strongly arcuated group in the genus, and was described by Van Duzee in his "Studies" under Fitch's name *fenestratus*, as subsequently pointed out by him. It was founded upon three females, one from Georgia, another from Massachusetts, and the third from Staten Island, N. Y. The latter is now before me. In my judgment the northern examples are specifically separable from those of the south, and of the three examples above mentioned that from Atlanta, Ga., should alone be regarded as the type of *celsus*. The structural characters which seem to me most distinctive are an extreme hairiness, the pronotal arcuation high above humeri, not retreating or with suggestion of anterior carinal sinus, a pronotal swelling back of upper part of anterior vitta and another before the posterior vitta, present in both sexes but in varying degree, with the mid-dorsal compression anterior to the latter a deep rounded pit. It seems to be far from common, and comparatively few undoubted males have been noted; none taken in copulation. As that sex has not been described, a characterization is here presented, based upon a specimen taken this past season in Alabama in a locality in which females were also taken.

Cyrtolobus celsus Van Duzee. (Plate II, Fig. 9)

MALE: Shining, hairy, more densely on face and metopidium. Pronotum evenly arched from base to summit before mid-dorsal translucent spot, its outline on metopidium exceeding plane of face, sinuate at translucent spot and anteapical vitta, barely attaining basal angle of terminal areole of fore wings.

Face mottled brownish testaceous, with inner margins of loræ dark brown.

Metopidium similarly colored, vague brownish bands from basal callosities above eyes running over humeri, punctures black. Coarse punctures of pronotum thickly interspersed with fine setæ-bearing punctures, the hairs three to four times as long as the diameter of the coarse punctures; compressions at anterior, mid-dorsal and anteapical pale spots strong and deep, the pronotum conspicuously swollen between them on either side of the mid-dorsal translucent spot. Oblique anterior vitta arising from middle of lateral margin, directed toward but not quite reaching base of mid-dorsal translucent spot, thence vaguely forward to above post-humeral sinus where it turns abruptly and broadly upward to dorsal carina. This vitta is broadly bordered posteriorly with dark brown, back of which the

pronotum is an umber brown, with narrow and deep white mid-dorsal translucent spot and vertical anteapical vitta.

Body beneath black, abdominal segments pale.

Fore wings hyaline, a dark fuscous cloud on terminal boarder encroaching on apical areoles.

Legs pale testaceous, femora above black.

Length 5 mm.

Allotype ♂. Hazen, Ala. V/4/'23. In my collection. Taken on *Quercus minor*.

A male specimen in the Funkhouser collection, taken at Southern Pines, N. C., corresponds with the above described allotype except that its coloring is prevailingly dull reddish. A female taken at Lakehurst, N. J., a region noted for the southern aspect of its fauna, is the most northern record I have seen for this species. In general it is of medium size, has a rather chunky appearance, with the high arch of the pronotum particularly full in front, and its surface characterized by unusually long and abundant setæ more or less erect, but confused in direction by the abrupt and irregular undulations of its tuberos surface. *C. clarus*, described in this paper, is also recalled by the deep and narrow mid-dorsal translucent spot; but in this species, as already pointed out, the pronotal arch is devoid of any suggestion of anterior sinus, is more roughly reticulate on the sides in the female, lacks the extended and deflexed pronotal apex of *clarus*, and is characterized by the posterior tuberosity of the pronotum above referred to. A figure of a female of this species is appended hereto on Plate II, Fig. 10; and the northern form so frequently confused with it is next considered.

Cyrtolobus funkhouseri new species.

The females of the following new species have a strong superficial likeness to those of *C. celsus* Van D., with which they are commonly confused. They particularly resemble that species in size, general form of the pronotum, and somewhat in detail; so that upon a more or less casual examination they would be ranged together. Indeed it was not till the evidently diverging characters of the males were noted, precluding their association, that those of the females, largely comparative though they be, were recognized as amply sufficient to distinguish them from *celsus*.

Briefly, the absence of the long, dense, erect hairiness of the pronotum is in itself adequate for the separation of this species from *celsus*; and from *vanduzeei*, which it also closely resembles, it is at once distinguished by the abruptly incurved clypeus, not protruding conspicuously below the line of the cheeks in frontal view as in that species and in *celsus*, as well as by its somewhat smaller size. The following detailed description of the two sexes will serve to indicate other points of divergence.

Cyrtolobus funkhouseri, new species. (Plate II, Figs. 11, 12.)

FEMALE: Medium in size, moderately hairy, hairs short, punctures of pronotum shallow, surface smooth, somewhat shining. Color dingy reddish brown, paler anteriorly, with usual vittæ and pellucid spots.

Face creamy white, smooth, sparsely and finely punctured with light reddish brown, more densely next to the eyes, much broader than long, the line of the cheeks continued by clypeus, which in front view is not produced below them, and in side view is seen to be strongly reflexed.

Pronotum with metopidium pale brown more or less mixed with cream, darker reddish brown bands rising from callosities above eyes to summit, but not passing over humeri; anterior oblique vitta creamy, back of which the pronotum is a darker reddish brown interrupted by mid-dorsal translucent spot and anteapical vitta. Punctures of metopidium twice as large as those of face, about half as large as those of pronotum back of humeri. Erect hairs of face and pronotum not twice as long as diameter of the large shallow punctures of sides of pronotum. Arch rather high, usually slightly retreating over humeri to a slight sinus indicated on carina before humeri and anterior to crossing of oblique vitta, and thence rising and arching evenly to posterior apex, with more rarely a slight sinus at crossing of anteapical vitta; its posterior process reaching to middle of terminal areole of fore wings. The anterior oblique vitta runs from above humeri back almost horizontally to a junction with the elongated mid-dorsal spot, and thence abruptly but obliquely down to lateral margin, reaching it, somewhat expanded, well back of posterior margin of mid-dorsal spot, and thence it runs forward narrowly along margin to base exterior to eye. Anteapical vitta vertical, broad, expanding on dorsal carina. Mid-dorsal translucent spot conspicuous, longer than wide, compression wide and deep; crest also compressed at crossing of carina by anterior oblique and anteapical vittæ, somewhat bulbous between the three compressions but not so much so as in *celsus*.

Body beneath testaceous.

Fore wings hyaline, washed with flavous, coriaceous at extreme base with usual punctures, tip slightly cloudy with apical cells a little invaded.

Legs testaceous.

Length 5.50 mm.

MALE: Like the female, smaller, strongly shining, red (in allotype and other examples) or black, the broad bands above callosities of metopidium continued over humeri to fill space between lateral margin and oblique anterior vitta; carina at base marked with blotch of red or black, which is repeated immediately anterior to the crossing of the oblique vitta. The pale vittæ and markings are whiter and more clearly defined than in the female, the deep mid-dorsal translucent spot apparently continued to pronotal margin by its junction with the inferior half of the abruptly deflexed oblique vitta. these markings having the effect of white bridle-reins and girth on the dark insect.

Body beneath black.

Fore wings hyaline, clearer than in female, with darker narrow terminal cloud.

Legs testaceous, femora above black.

Length 5. mm.

Holotype ♀. Litchfield, Conn. VI/30/'23. In my collection. Taken on *Quercus rubra*.

Allotype ♂. Yaphank, Long Island, N. Y. VI/15/'23. In my collection. Taken on *Quercus coccinea*.

Paratypes: A male and two females, Central Park, L. I., N. Y., and females from Litchfield, Conn., and Delaware Water Gap, Pa., in my collection; two males from Canada and one from Indiana in Nat. Mus. coll. A male from Lexington, Mass., and a female from Bedford, Mass., in Funkhouser collection; a male from Yaphank, N. Y., and females from Massapequa, Long Island, and Staten Island, N. Y. in Davis collection; and a male and two females from Bay Shore, Long Island, and four females from Yaphank, Long Island, N. Y. in Olsen collection, and one from Summit, N. J. (Dickerson) in Am. Mus. Nat. Hist. coll.

This species, in spite of its generally close resemblance to *celsus* in the female, is quite easily separated from it by two of the characters above pointed out, to-wit, the erect hairs of the pronotum, in this species not long nor very dense, those over the humeri less in length than twice the diameter of the lateral punctures of the pronotum, while in *celsus* their density is conspicuous and in length they exceed the diameter of the larger pronotal punctures from three to four times; and the other character is the clypeus, which is short, not exceeding line of cheeks, but abruptly incurved, whereas in *celsus* it plainly protrudes below the line of cheeks and is hardly at all incurved. Other differences are in the shallower pronotal punctures of this species, and its comparatively smooth surface, contrasting with the deeper punctures and

almost reticulate surface of *celsus*, the less forward arching of the pronotum here, with an anterior sinus usually indicated, while in that species there is rarely a suggestion of sinus; nor are the compressions at the pale spots of the crest, though marked, so deep as in that species, with its consequent greater bulbosity of the pronotum before and behind the mid-dorsal translucent spot. Furthermore, the oblique vitta in *celsus* meets the lateral margin further forward than here, rarely further back than the hind margin of mid-dorsal translucent spot; and again the fore wings of *celsus* are a much clearer hyaline. In the male the almost smooth and shining surface of pronotum without the strong swellings, and the much sharper definition of pattern, will serve to distinguish it from that sex of *celsus*, the vittæ being broad and clear, and together with the mid-dorsal spot often equalling the dark area of the rest of the pronotum.

An examination of the Staten Island example of the three specimens upon which *celsus* was founded shows it to belong here, as doubtless does the specimen from Massachusetts cited in its description; in fact, all specimens of this species which I have seen were taken in the north, while *celsus* seems to be primarily a southern species. The preferred host plant is not known, at least four species of oak having been found to harbor it.

Cyrtolobus vanduzeei Goding.

This is a southwestern and Pacific coast species found in great abundance on the western live oak, and as at present understood is subject to great variation in form and color, especially remarkable in the males. From my experience with other members of this admittedly variable genus the suspicion presents itself that there may be confusion here; and it is recommended that the guests of that host be carefully studied with particular attention given to the mating of the several forms, and that the results of that study be published.

Cyrtolobus clarus new species.

The following is a distinct species hitherto undescribed, and, so far as known at present, occurs only in our southern states. In Alabama I have found it one of the earliest species to reach

maturity, and the females at least to be fairly abundant. Figures of both sexes accompany this paper, and their description follows:

Cyrtolobus clarus, new species. (Plate II, Figs. 15, 16.)

A medium sized species, strongly recalling in form *C. fenestratus* Fitch, but with pronotum grayish rather than red, higher posteriorly at carinal sinus, and less attenuately produced apically.

FEMALE: Face between eyes about as broad as long, testaceous, punctures blackish at inner margins of eyes and outer margins of genæ and loræ. Clypeus narrowly produced, its sutures blackish, distinct. Ocelli much nearer to each other than to the eyes.

Pronotum granulate-punctate, little elevated arching between white anterior and posterior sinuses, thence prolonged in an acute apex which almost reaches that of fore wings. Metopidium at base between and including callosities narrowly brick red. On either side of the dark brown carina it is pale brown or testaceous. Externally of and next to this a very dark brown, or in some specimens reddish, narrow band rises from basal red margin over humeri to a point below anterior carinal sinus, where it abruptly terminates. Beyond the dark band and covering humerus to above post-humeral sinus the surface is yellowish testaceous, through the middle of which runs an obscure reddish band. Anterior oblique vitta white, slightly angled at its middle, runs from anterior carinal sinus to pronotal margin two-fifths from humerus, where sometimes it is slightly expanded forward; and the anteapical vitta runs from posterior sinus directed forward to margin two-fifths from apex. The anterior vitta is bordered in front, at least on its lower half, by a narrow reddish brown line, and in the rear by a black line sometimes as broad as itself. Between these vittæ at dorsal compression is a rectangular deeper than wide translucent spot on a reddish ground color, which latter likewise covers apex.

Body beneath flavo-testaceous.

Fore wings hyaline, with a slight flavescent wash; tips with moderate infuscation, encroaching on terminal areole.

Legs yellowish testaceous.

Length 5.60 mm.

MALE: In form and pattern like the female, but a little smaller; the dark punctures on the ground color giving it a more decided grayish effect.

Face testaceous yellow, coarsely and closely covered with black punctures. Eyes dark brown.

Pronotum reaching to a point vertically above base of terminal areole of fore wings. Anteriorly it is dark brown, testaceous toward humeri, coarsely granulate-punctate with brown and black punctures, giving it an irrorate grayish appearance, the dark punctures somewhat obscuring the anterior oblique white vitta. The reddish of the remaining surface in the

female is replaced by brownish black, the mid-dorsal squarish translucent spot and anteapical vitta distinct.

Body beneath black, genital segments flavescent, organs black at tip.

Fore wings clear hyaline, veins flavescent, tips margined narrowly with fuscous.

Legs pale.

Length 4.75 mm.

Holotype ♀. Hazen, Ala. IV/4/'21. In my collection.

Allotype ♂. Same locality and date. Also in my collection.

Paratypes: Seven males and forty-two females. Same locality IV/4-20/'21, & '23.

The holotype and allotype were taken on *Quercus digitata*, and the paratypes on *Q. prinus*, *rubra*, *digitata* and *minor* growing in a row along a road. No pair was taken certainly in copulation, though one pair was knocked off together; but they were taken from the same trees at the same time (the males only about one to six females), and the general form and pattern of these males shows such marked similarity to that of the females, that I feel no hesitation in holding them to belong to the same species.

In addition to those taken by me in Alabama, I have seen a female specimen from Orlando, Fla., in the Funkhouser collection, and a large series of both sexes from Louisiana in the Baker collection at the United States National Museum.

The bands over humeri suggest *C. discoidalis* Emmons, but in this species they are usually much less extended, and there is a third dark band between them, more or less developed and covering the metopidian carina. Perhaps its most characteristic mark is the (usually) narrow and deep mid-dorsal translucent spot. It is at once distinguished from both *fenestratus* and *discoidalis* by the conspicuously granulate appearance of the metopidium and pronotum in general, by the point of incidence (or origin) of the anterior oblique vitta on the lateral margin, being here well forward of the middle, and by the presence of the broad apical vitta, which here extends undiminished to the lateral margin. Inasmuch as no undoubted specimen of Say's widespread species *vau* has been seen by me from this locality, and on the possible supposition that this might be a form of that species, I have compared the two, and it is apparent that there can be no confusion between them. They are plainly distinct. From *vau*

it is distinguished by the greater arcuation of the pronotum and its much more pronounced apical sinus, by the greater production of the pronotal apex, which in *vau* barely reaches as far caudad as the basal angle of the terminal areole of the fore wings, the narrower than deep mid-dorsal translucent spot, the irregular posterior black border of oblique vitta, and the presence on the fore wings in the female of a terminal cloud. It also lacks the almost rectilinear lines which in *vau* usually characterize its pronotal carina from summit immediately back of the incidence of the anterior vitta percurrently to apex, and also in the posterior border of that vitta.

Cyrtolobus fenestratus Fitch.

The types of the female and male of this species are in the State Museum at Albany, N. Y., so no doubt can be entertained as to the identity of the insect upon which Dr. Fitch founded this genus under the preoccupied name *Cyrtosia*, for which Dr. Goding substituted its present name. Unfortunately, Mr. Van Duzee had not examined them at the time of the publication of his "Studies" (ante), so the reference to this species in that paper is erroneous, as subsequently pointed out by him (Can. Ent. 1909, p. 383). It is, in life, one of the most beautiful species in the genus, both in color and grace of outline. The female has a bright green head and body, which in the dried specimen becomes yellowish, and exhibits conspicuously the squarish window in the keel of the pronotum, the latter red, very slender, and tapering to the long, acute apex, which attains the apex of the fore wings with their narrowly but strongly clouded terminal margins. The males are by no means always black, as described, reddish ones with whitish testaceous vittæ occurring commonly. For aid in identifying males of this species, I present herewith on Plate VI, Fig. 43, a figure of a specimen of that sex; and in Fig. 44 one of a female also.

Cyrtolobus tuberosus Fairmaire.

The male of this species, while smaller and somewhat darker than the female which is generally recognized, closely parallels that sex in its coloring and markings, particularly as respects the

broad, elongate mid-dorsal translucent spot, which curves forward at the mid-dorsal compression to meet the anterior oblique vitta at about its middle. It is found on almost any species of large oak, and is one of the most abundant and best known species in the genus, presenting no difficulty in its identification. Florida examples seen by me are paler and pinker than those found in the north, but are otherwise typical.

Cyrtolobus grandis Van Duzee.

This rather large species has a crest somewhat like, though lower than, that of *C. tuberosus* Fairm., and is notable for the long and slender apical process of its pronotum. Its habitat is in our southwest.

Cyrtolobus discoidalis Emmons.

Considerable confusion seems to prevail respecting the identity of *Cyrtolobus discoidalis* Emmons, and I am by no means satisfied that the species usually passing for it in collections should bear that name. Van Duzee, with admitted hesitation, recognized in the "Studies" three specimens possessing shoulder bands as being probably examples of the species inadequately described under this name. One of them, a female in the Cornell University collection, seems to have been the basis of his more detailed description, at least it agrees closely with it, in which he notices the lack of correspondence between its oblique vittæ and those represented in the figure given by Emmons. Other discrepancies are to be noted. For instance, in the species represented by the Cornell example the anteapical vitta is obsolete and often entirely lacking, whereas Emmons describes and figures that vitta as plainly marked, though apparently dull in color. The figure in outline also shows the pronotal apex exceeding the terminal cells of the fore wings and almost attaining their apex, an extension of the pronotum which I have not seen closely approached by any specimen of this species. I might suspect from Emmons's figure that it was drawn from a specimen of *vau* Say as here recognized, though in that species the supra-humeral bands are rarely so pronounced as there indicated, and in outline it attains its highest point more forward than shown in his outline drawing. It is

significant that one of Van Duzee's three specimens above referred to, that in the Davis collection from Sparta, N. J., is evidently an example of *van* Say. Nor does Emmons's brief description bar out that species, drawn admittedly from a cabinet specimen, and perhaps somewhat discolored. Nevertheless, his figure is far from typical of *van*, and even though it falls short of fitting the species evidenced by the Cornell specimen, I deem it best for the present to continue to apply to the latter Emmons's name of *discoidalis*; influenced perhaps by the supra-humeral bands, not referred to in his description, and present in many other species in the genus, but well indicated in his drawing, and in this species very conspicuous, sweeping in a rather narrow but pronounced band from near margin of genæ across face at inner edge of eye, up over metopidium and shoulder, thence vaguely back, becoming evanescent over post-humeral sinus, sometimes merging in the dark area immediately anterior to the pale oblique vitta. This vitta is unusually broad at its marginal origin, so that its posterior border is well back of the middle. It is bordered anteriorly with a narrow blackish brown band more or less interrupted at its middle, and posteriorly with a very conspicuous similar dark band rising broadly from lateral margin and becoming attenuate superiorly. The character of this oblique vitta at the lateral margin, broadened and extended far to the rear, and conspicuously bordered in front and behind with dark brown or black, is, with the supra-humeral bands, diagnostic. Briefly characterizing it further, it is, in the female, a medium-sized yellowish testaceous species with dark irregular lines streaming rearward, the pronotum arching moderately with a rather obscurely pellucid mid-dorsal compression, a pale spot at position of anteapical sinus, which is otherwise hardly indicated, the anteapical vitta obsolete, and pronotal tip not attaining apex of fore wings, which are strongly enfumed, their terminal areoles broadly infuscated. The male seems never to have been described. Several examples have been taken by me, two with females in copulation. A figure of one of these, the description of which follows, as well as a figure of a female, accompany this paper.

Cyrtolobus discoidalis Emmons. (Plate VI, Figs. 45, 46.)

MALE: In general like the female, but a little smaller.

Face pinkish testaceous; clypeus hardly produced.

Pronotal margin from base above eye over humeri to junction with lateral origin of oblique vitta broadly whitish testaceous. Dark brown supra-humeral bands extending broadly rearward, filling in the space between testaceous margin and oblique vitta, the latter arising from lateral margin far to the rear, and bordered with black as in the female. Pronotum otherwise reddish testaceous, becoming darker red between oblique and broad white anteapical vittæ, the latter curving slightly forward and almost meeting origin of anterior vitta on lateral margin. Back of posterior vitta black. Mid-dorsal pellucid spot squarish and pronounced.

Body beneath black.

Fore wings slightly enfumed, broadly dark fuscous at apex.

Legs pale, femora above black, polished.

Length 5.65 mm.

Allotype ♂. Litchfield, Conn. VI/23/'20, in my collection. Taken on *Quercus rubra*, in copulation with female.

As is not uncommon with males in this genus, many are found with the pronotum wholly black or dark red except for the whitish anterior lateral margin, oblique and anteapical vittæ, and pellucid mid-dorsal spot. In these, where the humeral bands are merged in the ground color, the position and shape of the marginal origin of the anterior oblique vitta proves the most useful diagnostic mark.

Cyrtolobus aureus new species.

The following is a rather scarce species, judging from the paucity of examples thus far discovered; but it is one of the loveliest in coloring, particularly in the female, where in life clear green and pink are charmingly contrasted. It is a little above the average in size, and easily distinguished in that sex by the unusual character of the pronotal markings, which radiate from the lateral margin in widening streamers of alternate pale green and rose—whence the chosen name. It may be described as follows:

***Cyrtolobus aureus*, new species.** (Plate I, Figs. 7, 8.)

FEMALE: Face yellowish green, one-quarter to one-third broader than long, eyes rose. Clypeus hardly produced; sutures distinct.

Pronotum strongly elevated, evenly arched, highest a little forward of middle, punctuation very fine and irregular. The usual anterior sinus

between metopidium and superior arch of crest slight but evident, posterior sinus almost obsolete; apical process not at all deflexed, with a rather blunt aspect due to the lateral margin rising slightly to apex, the latter reaching, in the type, to an imaginary line erected vertically at apex of terminal areole of fore wings, in most specimens at hand barely reaching as far posteriorly as the basal angle of the areole. Color pale green and rose, as follows: Metopidium and humeri a bright light green. A broad rose band beginning on crest just back of anterior sinus, and expanding obliquely downward, reaches lateral margin at rear of post-humeral sinus, and extends along that margin to its middle. Back of this is a broader vertical green band, somewhat triangular in shape, narrowed below by encroachment of anterior rose band, and reaching lateral margin. This is followed by a second rose band descending straight to margin, another green band only one-third as wide from position of posterior sinus to lateral margin, and back of that is rose again, covering pronotal apex.

Body beneath light green; ovipositor deep rose.

Fore wings hyaline, immaculate, their terminal margins and posterior half of veins washed with rose, the anterior half light green.

Legs flavous, tarsi apically rose.

Length 6.50 mm.

MALE: Pronotum arching similarly to female, but much lower; somewhat shining, punctuation much coarser. Color black and yellowish testaceous.

Face black, margins and front deep rose.

Pronotum black, with basal margin of metopidium, humeri and post-humeral sinus narrowly outlined with deep rose. Crest black, a narrow irregular testaceous band from just back of middle to lateral margin, slightly inclined rearward in descent, the lower half of pronotum between this band and post-humeral sinus dark reddish, and a testaceous vertical band from posterior sinus of pronotal carina to lateral margin, corresponding to the apical green band of the female. Apex dark rose.

Body beneath black, ventral segments deep yellowish testaceous.

Fore wings sub-hyaline, washed with fuscous, the apical margin darker, but not maculate.

Legs yellowish testaceous.

Length 5.75 mm.

Holotype ♀. Litchfield, Conn. VI/16/'22. Taken on *Quercus alba*.

Allotype ♂. Same locality, date and host plant. Both in my collection.

Paratypes: Two males and seven females. Litchfield, Conn. All on *Quercus alba*. Also in my collection.

The holotype and allotype were taken by me *in copula*, the pronotum of the male being somewhat deformed and twisted at its apex.

This species, of an unusual pattern in the genus, seems to be rare. The only specimens I have seen, other than the few taken at the type locality, are a female taken at Newark, N. J., and a female and two males taken at Berkley Heights, N. J. (E. L. Dickerson), in the collection of the American Museum of Natural History, New York, two males taken at Pine Island, N. Y., and at Yaphank, Long Island, N. Y., in Mr. Davis's collection, two males taken at Rochester Junction, N. Y., in Dr. Funkhouser's collection, a female with a "N. J." label in that of the National Museum, and what appears to be a male of this species in the same collection, taken at Chicopee, Mass.; also a female in Mrs. Slosson's collection taken by her at Delaware Water Gap, Pa. Figures of the holotype and allotype are herewith presented, the outline of the deformed pronotal apex of the male corrected in the drawing to conform with that of another specimen.

Cyrtolobus cinctus Van Duzee.

This species is not represented in any collection to which I have had access except possibly that of Dr. Funkhouser with a non-typical female lacking the lateral black arcuate line, taken at Ithaca, N. Y., the type locality, and that of Cornell University, which contains the type female, as well as the supposititious male. The latter has been submitted to me through the courtesy of Dr. Bradley of that university, and is in my opinion undoubtedly a male of *C. fuliginosus* Emmons. In my own collection is a female taken by me at Bronxville, N. Y., which is apparently of this species. I have critically compared it with the type, with which it agrees except that the so-called anterior vitta of the original description, an arcuate narrow black line, in my specimen has its origin on the lateral margin of the pronotum further forward, over post-humeral sinus, rises vertically about half way, and then curves forward and upward to dorsal carina. Back of the upper half of this line the green pronotum of this specimen is somewhat stained with brown. Notwithstanding these differences, I believe this female and the above type specimen are of the one species. Standing side by side, it seems impossible to separate them specifically. It might be pointed out that in this genus the vittae are pale when apparent at all, and therefore the black line in the type, although occupying a position corresponding

to that of an anterior oblique vitta, is not necessarily to be regarded as that vitta. Accordingly the more forward position of that black line in the Bronxville specimen may be significant of a variation of pattern rather than a displacement of so characteristic, though far from invariable, generic mark as the vitta in question. The capture of further examples of this species is greatly to be desired, particularly that of an undoubted male taken *in copula*.

Cyrtolobus vau Say and *sculptus* Fairmaire.

The first species assignable to this genus to be recorded from this country was taken in Pennsylvania, and was described by Thomas Say in 1831 under the name *Membracis vau*. Although the genus as now recognized and delimited to which the species as described by him belongs (*Cyrtolobus*) contains in this country many other distinct species, many of which are fairly abundant in those parts of the United States in which Say collected, it is a significant fact that, except for *C. inornata*, he never described another species assignable to it. The significance lies in its bearing on the question as to just which one of these many species we are to recognize as *vau* Say. As is well known, practically all of his types have been destroyed, including those in this family; so we are thrown back on his description, given in considerable detail, and, to supplement that, such collateral and inferential evidence as may be available. In the first place it became evident that there was no concord of opinion as to its identity, almost every collection to which I have had access having different species standing under the name *vau* Say, most of the species so assigned presumably having been found to agree substantially with the original description. That this should be true is not at all strange, as there is a prevailing type of pattern in the genus, well indicated in that description, which, while not universal, is found in a large number of distinct species, and the dimension given by Say—one-fourth inch in length—has very reasonably, though erroneously, been regarded as a general approximation. As other students had done, so I attempted to determine from material of my own collecting, irrespective of other determinations, whether any of it might be placed under that name with a colorable title to it. One species seemed preeminently to

display the requisites of Say's description, and the considerable material from our northeastern states and Canada representing this species in my collection included specimens from the state which Say said *vau* "inhabits"—Pennsylvania. But this species I had already determined as Fairmaire's *sculptus*, both from the original description and from that contained in Van Duzee's "Studies" (ante). Specimens thus labelled *sculptus* Fairm. were then sent to Dr. Funkhouser for confirmation, and promptly returned with his identification of them as *vau* Say. Notwithstanding their accord with Say's description, and the conspicuous approach in the female (the sex now under consideration) of the anterior oblique and posterior vittæ at the lateral pronotal margin, forming the character V which Dr. Funkhouser pointed out was very likely what Say intended to indicate by his specific name, the specimens in question in my opinion were undoubtedly *sculptus*, Fairm., so remarkably well did they conform to his description. In this predicament resort was now had to the examination of specimens which our entomologists of earlier generations had recognized as of this species; and learning that the Thaddeus Harris collection in the museum of the Boston Society of Natural History contained examples purporting to be *vau* Say, I next examined that. Dr. Harris was a contemporary and friend of Say, so my hopes of resolving the difficulty were high. The collection contained two specimens bearing the number 224♀, one of which also bore a label with the letter U in red ink. Turning to Harris's original Catalogue, the first entry of which, in what is evidently his own handwriting, is "This book was begun in 1822", the following appears on page 1 in red ink in the same handwriting:

"Note. Insects underlined with red ink have had their names confirmed by Mr. Say; and the names and observations in red ink are those sent to me by Mr. Say, after he had examined the collection which I sent to him in November, 1833. To the uniques sent to Mr. Say are added the letter U."

Turning over the pages of this Catalogue to the heading "Index Hemipt, Section Omopt", and running down the numbers, one comes to "224 *Membracis vau* S Mss. *Membracis*? June 15, 1832. Camb. June 15, 1835". The words above, *Membracis vau* S., are in red ink. So it is apparent that in November, 1833,

Harris sent to Say the specimen bearing the red ink label U, collected June 15, 1832, and that Say returned it with the name "*Membracis vau*", which Harris entered in his Catalogue in red ink, so indicating its identification by Say. At first sight that would seem conclusively to establish the identity of *vau*,—this unique Harris specimen determined by the describer himself as identical with his *vau*. But the specimen does not well accord with the original description! It does not fit it! It has no transverse line near the tip, which much exceeds the end of the nervures of the hemelytra. Could Say himself have made a misidentification of his own species? Why not? At that time *vau* was the only species yet recognized and described which is assignable to this genus. What more natural than that Say should recognize the generic relationship and assume Harris's specimen to be identical with the sole species known—possibly regarding the differing form and pattern as constituting but a variant of that species? For many years and by many students this species has been regarded as subject to great variation, Dr. Fitch for instance, in 1851, briefly indicating ten different varieties of *vau*, eight of which later study has shown to represent two other subsequently described species.

And what did Dr. Fitch himself recognize as typical *vau* Say? Not the species represented in the Harris collection and so determined by Say, but that species which Van Duzee in his "Studies" seems to have regarded as *sculptus* Fm. This specimen is still in the Albany "Cabinet", with Dr. Fitch's printed label No. 658 on its pin, as indicated in his published record,¹ and though somewhat faded is clearly recognizable. And this specimen does agree with Say's description of *vau*! It would be interesting to learn how Dr. Fitch arrived at his determination; but however arrived at, I have no doubt it is correct.

As is well known, a part of Dr. Fitch's material was acquired by the National Museum, and included in that is a much less faded example of this species, a female, bearing on its pin what I was advised at the Museum was Dr. Fitch's large black bordered label with the inscription "*Thelia vau* Say, New York,

¹ Cat. Homop. Insects State Cabinet Nat. Hist., 4th Ann. Rept. N. Y. Univ. 1851, p. 48.

Ark." Passing over the question as to whether the specimen came from Arkansas, in which State there is at present no place named New York, nor have I seen any other specimen from that section; or from New York State, possibly the Adirondack region, the label is interesting in that it bears, under the words "*vau* Say", and in smaller pen printing, the words "*sculpta* Fairm."! So Dr. Fitch, if that label be his, had come to the conclusion that Fairmaire had before him, when describing *sculpta*, the same species which was before Say when the latter described *vau*. That accords with the conclusion independently arrived at by me. Specimens with the antepical vitta sub-obsolete, conspicuous only at dorsal carina, are frequently found. The species here determined to be *vau* Say averages about 6.25 mm. in length, and while not quite so long as given in Fairmaire's description, 7 mm., fits it otherwise fairly well; and has long stood as *sculptus* Fairm. in many collections, including my own. No other species known to me accords with that description so well as does *vau* recognized as above. I am not unmindful of the pale form here referred to *fuliginosus* Emmons. In many respects that too answers fairly well to the description of *sculptus*, though the length is still about a millimeter too little. But it is much more than "a little elevated", and a good deal of imagination is required to see the thinner areas on its dorsal margin as "two almost transparent spots", which Fairmaire describes with greater emphasis than is used on the same page in describing them in *tuberosus*, so very conspicuous in that species. With this eliminated, I believe Fairmaire's *sculptus* should be regarded as based upon the same species as Say's *vau*, described in 1831, and if it is, the latter name has fifteen years priority, and Fairmaire's *sculptus* must be placed in the synonymy of *vau*.

Figures of the male and female of this common species in the northeastern United States and Canada are given on Plate I, Figs. 1 and 2, that there may be no confusion as to just what species is here considered.

Cyrtolobus limus Van Duzee.

This species is somewhat smaller than *vau* Say as here recognized, with its anterior and posterior vittæ broad and white, and the mid-dorsal translucent spot conspicuous. It was described

from Colorado, and is found in the Rocky Mountain region, commonly on *Quercus gambelli*.

Cyrtolobus pulchellus new species.

The following new species is of medium size, with a high, strongly compressed crest, the white markings conspicuous and coloring sharply contrasted. In form and pattern it suggests the little *parvulus* Woodruff (post), but is very much larger, and shows these differences, among others: Lacks the mottled aspect; arch of crest from base of metopidium more retreating; keel but little raised immediately above humeri, slightly sinuate at very prominent anterior white spot, suddenly descending anterior to anteapical vitta; posterior process attenuate; apical cloud of fore wings less squared; femora above pale. Its coloring is about that of *gramatanus* Woodruff (post), but from this it differs in being larger, very much higher, and with a totally different form of pronotum, as well as in lacking the maculation at middle of fore wings, though the veins of the latter in that region are often slightly darkened. Figures of the holotype and allotype are appended, and their description follows:

Cyrtolobus pulchellus, new species. (Plate IV, Figs. 29, 30.)

FEMALE: Medium in size, the crest strongly compressed, arching from back of humeri to just before anteapical sinus, the pronotal tip attenuate, and the colors sharply delimited by black.

Face dull testaceous, sometimes yellowish, the sutures distinct, often narrowly marked with rufous or black; clypeus produced beyond line of genæ, little incurved, the genæ strongly sinuate inwardly near eyes.

Pronotal carina curving evenly over slightly retreating metopidium from base to above humeri, thence with slight sinuation at pronounced anterior white spot to summit just before mid-dorsal translucent spot, thence descending gradually to half way between that spot and anteapical vitta, where it develops an abrupt declivity, is sinuate over that vitta and continues to tip of the somewhat extended and attenuate posterior process; the tip of the latter sharp, attaining as far caudad as apex of terminal areole of fore wings, in some specimens attaining only to its basal angle. Metopidium yellowish testaceous, carina black from base to summit, broad strongly arched reddish supra-humeral bands recurved to post-humeral sinus, the humeri yellowish with a reddish blotch on their anterior face, and more or less mottling of rufous and black anterior to the oblique vitta. This vitta is very broad at lateral margin and at carina of pronotum, but

more or less interrupted about the middle, its posterior margin leaving lateral margin of pronotum a little anterior to posterior margin of mid-dorsal translucent spot, directed obliquely forward to below but not reaching lower anterior corner of that spot, thence more arcuately forward to slightly anterior to rear of post-humeral sinus, thence vertically to carina of crest. Mid-dorsal translucent spot broad and deep, conspicuously square, very strongly compressed to its bottom. Anteapical vitta broad at margin, widely expanding forward and rearward till at carina it equals or exceeds width of mid-dorsal translucent spot. All vittæ white broadly margined before and behind with black. Pronotum between vittæ dark red, apex beyond black border of anteapical vitta white, more or less besprinkled with black or rufous.

Body beneath testaceous, ninth abdominal segment in dry holotype and other specimens before me washed with rufous.

Fore wings hyaline, darkly infuscated at base; veins pale, very slightly enfumed at middle; tip with more or less rounded very dark brown cloud covering terminal areole and apical third of cell above it, but not extending up terminal margin above that cell, margin slightly enfumed between apical cloud and pronotal tip.

Legs, including the femora, testaceous.

Length 5.65 mm.

MALE: Like the female, but a little lower and much darker.

Pronotum before the anterior oblique vitta washed with blackish red except at middle of base and shoulders; between the vittæ almost black, the compressed crest somewhat bulbous between the squarish mid-dorsal translucent spot and the very broad anteapical vitta; its apex wholly black, or reddish, sharp, but not so produced as is that of female generally, reaching hardly beyond basal angle of terminal areole of fore wings.

Body beneath black, ventral segments testaceous marked with black on sides, middle, and sexual organs.

Legs also as in female, wholly testaceous.

Length 5.40 mm.

Holotype ♀. West Nyack, N. Y. VI/11/'20. (C. E. Olsen.) In my collection.

Allotype ♂. Same locality and date and collector. Also in my collection.

Paratypes in collections of Chris. E. Olsen and Am. Mus. Nat. Hist.

Of this distinct species, one of the many denominated *vau* in collections, and for the types of which I am indebted to Mr. Olsen's generosity, I have a considerable series before me. Besides the type locality it has been taken in various places in the northern half of New Jersey. No record of its host plant is at present available.

Cyrtolobus parvulus new species.

Among the many forms which have been standing in various collections under the name *vau* of Say is the following distinctive little species, one of the smallest in the group. It bears the usual pronotal pattern, and is perhaps most easily set apart from other similar small species by the jet black upper surface of the femora of the female. Figures of specimens of both sexes are here presented, and their description follows:

***Cyrtolobus parvulus*, new species. (Plate IV, Fig. 31, 32.)**

FEMALE: A brown and red species with a rather mottled aspect, having the usual white markings prominent.

Face between eyes a little broader than long, yellowish testaceous, sprinkled with small brown punctures. Clypeal sutures distinct, clypeus a little produced, incurved.

Pronotum coarsely and roughly punctured, including humeri, decidedly elevated, compression of keel beginning below middle of metopidium, pronounced anterior to and above humeri, strongly compressed at mid-dorsal translucent spot, the lower anterior corner of which seems conspicuously sunken by reason of the decidedly tumidous swelling of the crest immediately before it, very evident from a front view. Crest arches from base of metopidium to highest point just back of post-humeral sinus but anterior to mid-dorsal translucent spot, and thence slopes undulatingly, with slight sinuations at mid-dorsal spot and anteapical white vitta, to apex, which exceeds terminal areole of fore wings and attains middle of their terminal border. Metopidium flavo-testaceous, thickly marked with dark brown punctures, congregated so as to form dark brown spots above callosities and over humeri, the latter washed with light brown. In one specimen at hand these punctures are light brown, the dark brown being confined to the spots above callosities over eyes. Anterior oblique vitta indicated at lateral margin by a usually well developed white spot with a tendency to run forward along margin, and which, in the type and in some other specimens before me, but not in all, rises with indefinite forward bounds toward anterior lower corner of mid-dorsal translucent spot but does not reach it. This vitta is bordered posteriorly by a narrow black line which curves up and forward to lower anterior corner of mid-dorsal white spot, and then rises abruptly along the anterior edge of the latter to summit; a branch also sometimes runs forward from lower anterior corner of mid-dorsal white spot to anterior white spot, and then bordering the latter posteriorly rises to summit. Keel on rising from metopidium blackish, immediately succeeded by a large white spot, thence rich dark red to apex, interrupted by squarish (sometimes elongate) prominent mid-dorsal translucent spot and by anteapical vitta. The latter white, broad, extremely so on carina, narrowing as it approaches lateral margin, its posterior border

sloping strongly cephalad from summit to margin. Dark red surface of apical process somewhat besprinkled with small testaceous spots.

Body beneath dingy testaceous.

Fore wings clear hyaline, veins flavous, tips from below apical process of pronotum broadly very dark fuscous, anterior border of fuscous cloud squared, covering terminal areole.

Legs dingy testaceous, femora above on all legs shining jet black.

Length 5 mm.

MALE: Like the female, but decidedly smaller, arching evenly and much lower, markings usually the same, and differing only as follows:

Face washed with red, sutures between clypeus and loræ black. In some specimens face is dirty testaceous, black centrally above and adjacent to eyes.

Pronotum rather low, sinuations much less marked, apical process hardly attaining basal angle of terminal areole of fore wings. Base of metopidium and humeri washed with pink in allotype and some specimens, in others dingy testaceous. Sometimes the whole of metopidium is thus washed, and the brown mottling seen in the female lacking. The dark red of the pronotum in that sex varies in the male from black to pale red. The oblique anterior vitta here shows a tendency, more rarely seen in the female, to form a connection with anterior white spot on carina.

Body beneath and abdominal segments black; genital segments and organs clear testaceous, hooks of styles and caudal half of keel of sternal plate black.

Fore wings often very slightly suffused with flavous, fuscous at tip, in most specimens at hand the clouding not reaching apex of pronotal process, but covering terminal areole as in female.

Legs dull testaceous, femora above black.

Length 4.5 mm.

Holotype ♀. Lakehurst, N. J. VII/2/'22. Taken on *Quercus prinoides*.

Allotype ♂. Lakehurst, N. J. VI/16/'17. "Beating Oak," Both in my collection.

Paratypes: Three males and twenty-six females, Lakehurst, N. J. In my collection. Also one male and one female, same locality, in collection of W. T. Davis.

This little species is not likely to be confused with any other than *puritanus* herein described, from which it may be distinguished by its slightly greater size, its coarser, rougher punctuation, wholly lacking any lustre, notably over the shoulders; by the swelling of pronotal crest between anterior and mid-dorsal spots, that part being included in the dorsal compression of *puritanus*;

by the greater extension of pronotal apical process in the female; by the brown mottling of metopidium and over humeri, particularly in the female; by the conspicuous white anterior spot, the somewhat narrower mid-dorsal translucent spot, and in the female the dark red apical process besprinkled with white; by the black superior surface of the femora of all the legs in the female, and the much darker and more extended apical cloud of the fore wings.

It has been found by me almost without exception on *Quercus prinoides*, and I have no doubt that that is its preferred if not exclusive host plant.

Of this species I have seen none but Lakehurst examples except from localities on the south shore of Long Island, N. Y., the fauna and flora of which is in many respects notably like that of the "pine barrens" of southern New Jersey, and a series of one male and five females taken on "scrub oak" at Karner, N. Y., a locality where both *Quercus ilicifolia* and *Q. prinoides* abound.

Cyrtolobus puritanus new species.

The following new species is the smallest of the genus known to me, as well as one of the liveliest in both sexes. My captures have been but a fraction of those shaken into my umbrella. It is especially neat in appearance, and in form, color and pattern roughly suggests a miniature *vau*. From other small species it is most conspicuously differentiated by the disproportionately large mid-dorsal translucent spot, and the marked compression of the pronotum in that region. Figures of specimens of both sexes are herewith presented, and their description follows:

Cyrtolobus puritanus, new species. (Plate V, Figs. 33, 34.)

FEMALE: Moderately elevated, but notably small; punctures rather distant, shallow and small over humeri; somewhat shining; dark reddish brown with the usual white markings slightly dingy; the mid-dorsal translucent spot conspicuously broad.

Face between eyes broader than long, hairy, testaceous, sparsely covered with small pink punctures, darker bordering eyes and on frons. Clypeal sutures indistinct, those bordering loræ indicated by red lines in holotype, by brown in other specimens, the loræ produced below genæ; clypeus broad, incurved.

Pronotum strongly compressed at the middle for at least half its height, the keel consequently sharp and narrow, including in considerable degree

that part of the crest anterior to mid-dorsal translucent spot. It arches from base of metopidium to highest point above post-humeral sinus and a little before mid-dorsal spot, further rearward than in *parvulus* Woodr. (ante), and thence slopes to apex with posterior sinus slight but evident. Anterior sinus absent, but indicated by a very small white spot placed far forward at summit of metopidium. Posterior process attains apex of terminal areole of fore wings. Metopidium hairy, testaceous at basal middle, narrowly over humeri, and at margins of post-humeral sinuses. Carina of metopidium black, interrupted by four successive white spots. Two reddish brown bands arise at callosities over eyes, expand above, becoming a brighter red over humeri, and extend broadly beneath mid-dorsal translucent spot to anterior margin of white oblique vittæ. The latter arise at mid-lateral margin, are sharply defined, gradually narrowing and running into mid-dorsal spot at about the middle of its lower edge and not extending beyond it. Mid-dorsal translucent spot conspicuously large—broad, deep, squarish—extending below base of deep compression, but broader than deep. Surface anterior to it dark red with black punctures, and posterior to it wholly dark red. Anteapical vitta rather broad, widening broadly on carina, bordered anteriorly with black punctures. Apical process beyond this vitta long, about one-quarter the length of pronotum along lateral margin, testaceous, sparsely punctured with black.

Body beneath testaceous, ovipositor dark basally.

Fore wings dingy hyaline, veins flavous, apex very slightly infuscated.

Legs pale testaceous, fore femora slightly infuscated above.

Length 4.40 mm.

MALE: Like the female, slightly lower and smaller; color darker and richer, with the white markings a clearer white, and differing only as follows:

Face more or less washed with red, in some specimens with brown, and with many black punctures, including clypeal sutures.

Pronotal callosities over eyes black, punctures rather fine, distant and black; apical process more or less blunt, dark red with black punctures, attaining only to basal angle of terminal areole of fore wings.

Body beneath and abdominal segments black, genital segment pale, styles and lateral valves black.

Fore wings clear hyaline, a broad fuscous cloud along apical margin broadly invading terminal areole, veins blackish.

Legs pale, all the femora above black.

Length 4.10 mm.

Holotype ♀. Litchfield, Conn. VII/8/'21. Taken on *Quercus coccinea*.

Allotype ♂. Same locality and host plant. VI/15/'22. Both in my collection.

Paratypes: Three males and four females, Litchfield, Conn., in my collection; one male and one female each, as follows: White Lake, Can.,

Funkhouser collection; Lake Toxaway, N. C., Slosson collection; Roselle Park, N. J., coll. Am. Mus. Nat. Hist., N. Y.; Auburndale, Mass., coll. C. W. Johnson; Jamesburg and Cranford, N. J. respectively, Davis collection; and females as follows: St. Anthony Park, Minn., coll. Univ. Minn.; Atherton, Mo., coll. Univ. Kansas; Pleasant Valley, Conn., coll. Brooklyn Museum.

A very considerable series of this species is before me, including material from Toronto, Can., New York, Long Island, N. Y., Pennsylvania, and Georgia, in addition to the states above cited. It is a very distinct little species, particularly notable for its small size and proportionately large, square, strongly compressed mid-dorsal translucent spot, and its clear unmottled coloring. It has been found confused in several collections with the species last above described (*C. parvulus* Woodr.), both masquerading under the label *vau*. Its distinction from *parvulus* has been fully pointed out in the discussion of that species. From the records at hand it is evidently widely distributed throughout the north and east, extending south in the higher altitudes.

Cyrtolobus acutus Van Duzee.

The remarkably narrow and produced clypeus serves as an excellent specific character by which to recognize this very slender small species, marked with the usual vittæ and pellucid spot so prevalent in the genus. Its habitat seems to be in the mountainous parts of our central-western and southwestern states.

Cyrtolobus maculifrontis Emmons.

I am somewhat at a loss to account for the close association to "*vau*", taking that reference to mean the species here designated as pale *fuliginosus*, accorded this species by Van Duzee in his "Studies", as well as for the extreme length with which he there credits it. His characterization of the species in other respects certainly accords with the extensive material which I have accumulated; but that material is of one of the decidedly smaller species, the females measuring from an extreme length of 5.5 mm. down to 4.5 mm., and the males averaging less, as usual; and their appearance is very distinctive, much more nearly approaching *intermedius* than *vau* or *fuliginosus*. It may be that a pale speci-

men of the former, heretofore commonly associated with *vau*, was in mind. In this connection I might advert to the possibility of the confusion of two species here. It may be observed that Mr. Van Duzee based his remarks on *maculifrontis* primarily upon a series taken by him in Georgia. The males of my Alabama material, and a series of males before me from Clayton, Ga. (W. T. Davis) and Southern Pines, N. C., average considerably larger than northern males, and are wholly pale beneath instead of black. Nevertheless, their general habitus is that of this species, and I do not feel warranted in separating them. Mr. Van Duzee's question of the accuracy of Emmons's figure must have been due to paucity of examples, for the anterior oblique vitta frequently is apparently transverse, arising vertically from the lateral margin and joining the mid-dorsal translucent spot, its forward extension obscured. Between this combination transverse band and the anteapical vitta the pronotum is usually contrastingly darker than the surface anterior to it. This is true in both sexes; but it should be borne in mind that the markings in this species tend to obsolescence. The anteapical vitta is wide and crosses the posterior process unusually near its apex. This feature, and the dark surface before it, the somewhat hairy character and coarse punctuation of the pronotum, and in the male its abbreviation, the lateral margin curving upward to apex so as to expose an unusual proportion of the flavous hyaline fore wings without apical cloud, serve to aid in the identification of those frequent specimens in which the black blotches on the metopidium are lacking. The figure of a male is herewith appended on Plate V, Fig. 42, in which the yellow pigment of pronotum is replaced by a rich brown, the frontal pronotal blotches and other markings sub-obsolete, but the posterior darker saddle nevertheless evident. This color form is common. The specimen figured was taken at Litchfield, Conn., VI/29/'20 on *Quercus alba*, and measures 4.45 mm. in length.

Cyrtolobus intermedius Emmons.

Cyrtolobus intermedius Emmons is a species which, as I understand its status, is subject to wide range in color and definition of pattern, in some respects wider than in *rufulus* herein described. The species was founded by Emmons on what was probably a female specimen, of a wholly dark mahogany red without

evident vittæ or other markings, and well figured on Plate XIII, Fig. 16, of Vol. 5, Agri. Nat. Hist. of New York (1854). Examples of such females are by no means rare; but those with the presence, indicated in varying degree, of vittæ and the mid-dorsal translucent spot on the dark red surface are more frequently met with, and this surface color itself, if I apprehend the species aright, tends to range through lighter and lighter shades till the extreme of pale creamy color, with markings again obliterated, is reached. The more common forms are predominantly pale with the usual *Cyrtolobus* pattern, and of these I have examples which I have taken *in copula* with males absolutely indistinguishable from males thus taken with females of the dark red mahogany form. Furthermore, no structural feature to differentiate the pale and dark forms can be discerned by me, while some marked characters are shared by both. Though invariably separated in the collections examined, the pale ones variously assigned, usually either to *vau* Say, *fenestratus* Fitch, or *discoidalis* Emmons, the conclusion seems irresistible to me that they are the same. The figure of a very pale reddish yellow female with markings obscurely indicated is here shown on Plate III, Fig. 22. It was taken at Litchfield, Conn., VI/23/'22, in copulation with the male shown in the accompanying Fig. 21, and as that color phase differs widely from the type form and has not yet been described, its description is herewith presented in detail.

***Cyrtolobus intermedius* Emmons.**

FEMALE: A pale yellowish, low arched species, almost testaceous, with the usual vittæ and pellucid dorsal spot present, but tending to obsolescence. Punctuation rather fine, granulate.

Face between eyes but little wider than long; clypeus broad, somewhat produced, but only slightly below line of genæ, sutures distinct. Color yellowish testaceous, sparsely covered with slightly reddish, or more frequently black, punctures.

Pronotum low, rounding over humeri, arching very little, highest back of post-humeral sinus, strongly compressed at mid-dorsal translucent spot as though with blunt-pointed forceps, producing a seemingly foveate compression beneath that spot; a little swollen in outline and laterally between mid-dorsal spot and anteapical vitta; posterior process hardly differentiated, not decurved, reaching middle of terminal areole of fore wings. Color pale yellowish on metopidium, with two narrow light red bands rising from callosities over eyes toward but not reaching its summit over humeri. A

more or less indistinct dingy white anterior oblique vitta arising from middle of lateral margin, curving forward well below small mid-dorsal translucent spot, and reaching carina of crest above post-humeral sinus, back of which the pronotal surface is dull light reddish, more or less mixed with yellowish. Anteapical vitta vertical, correspondingly obscure. In some specimens the anterior and posterior parts of the pronotum are more contrastingly yellowish and reddish respectively; and in many the surface is generally suffused with dark reddish, suggesting the type form; but even in these the short shoulder stripes are discernible, and the weak vittæ and mid-dorsal translucent spot are more evident in contrast.

Body beneath flavous.

Fore wings hyaline, rather dark reddish over corium, veins and terminal border distinctly flavous. No terminal cloud.

Legs pale testaceous.

Length 5.60 mm.

The male of this species, not heretofore described, is characterized below, its description being drawn from a specimen taken by me in copulation with a dark red female closely corresponding to Emmons's figure, but with the mid-dorsal translucent spot present. It is practically indistinguishable from the male shown in Fig. 21.

MALE: Smaller and even lower than female.

Face testaceous, unevenly marked with black punctures. Clypeus but little produced.

Pronotum with characteristic fovea below mid-dorsal translucent spot; apical process not reaching to basal angle of terminal areole of fore wings. Metopidium testaceous centrally to its summit, dingy white laterally above eyes, over humeri and along post-humeral sinus and lateral margin to a conjunction with anterior oblique vitta at its marginal origin. This vitta in the specimen in hand is much interrupted by the black of pronotal surface. Bands from callosities over eyes black, in some specimens dark reddish brown, expanding on summit of metopidium and continued back so as to fill the space between the dingy white of the oblique vitta and lateral margin. The remainder of the pronotal surface in this and most specimens is black, the white mid-dorsal translucent spot and anteapical vitta in sharp contrast against it. In many examples however the black of the pronotum is replaced by brown or by a dark red.

Body beneath black, lateral valves of genital segments and sternal plate dark red.

Fore wings hyaline, with dark red corium, and dark fuscous cloud almost covering terminal areole and apical portion of cell above it.

Legs testaceous, femora above black.

Length 5.50 mm.

Allotype ♂. Litchfield, Conn. VI/30/'23. In my collection. Taken with female in copulation, on *Quercus coccinea*.

This species, in size decidedly smaller than *vau* Say, with which it is often confused, is, as stated above, generally pale in the female, with the male very similar to the male of that species. In the latter sex the conspicuous extension of the pale color of the anterior oblique vitta from its lateral origin forward along margin of pronotum and over post-humeral sinus to base of metopidium will serve to distinguish it from *vau*, while both sexes are characterized by the strong foveate impression at the base of the mid-dorsal sub-pellucid spot, and by the base of the fore wings being dark reddish, the apices of those of the female without fuscous cloud.

It may be worth while to call attention to the humeral bands in this species for the purpose of emphasizing that their presence is not to be taken as the exclusive hallmark of *discoidalis* Emmons. Several other species possess them as well. Its distribution is general throughout our northeastern territory; and in New York, including Long Island, and Connecticut, the state in which most of my collecting has been done, it is abundant, and is found on almost any species of large oak.

Cyrtolobus gratiosus new species.

The following new form, apparently represented in my collection by both sexes, and from their general habitus seemingly entitled to specific recognition, is nevertheless accorded it here with some diffidence. The difficulty lies in delimiting it, owing to the very scanty material thus far observed which I have felt warranted in segregating as components of this species. The several specimens which have been associated in my box with those hereinafter designated as the types have been so allocated tentatively; yet no other assignment of them seems to me plausible; nor do the types seem very closely related to any known form, pale specimens of *intermedius* Emm. perhaps presenting the nearest approach to them. It is earnestly hoped that further material will be acquired which will tend to furnish a clearer apprehension of this species, particularly a copulating pair, as the holotype and allotype herein described are associated together as one species only by reason of similar facies and a common locality of capture. It is below medium size, very little elevated on pronotal carina,

its most distinctive superficial character being the olivaceous yellow of the fore part of the pronotum.

Cyrtolobus graciosus, new species. (Plate III, Figs. 23, 24.)

FEMALE: Face between eyes a quarter wider than long. Yellowish testaceous, coarsely punctured. Clypeus moderately incurved, its sutures at loræ outlined with black punctures, such punctures condensed at inner margins of eyes and on frons. Eyes dark.

Pronotum anterior to the oblique vitta olivaceous yellow, marked with two narrow reddish bands arising at inner edge of callosities above eyes but hardly extending above humeri. Anterior and posterior carinal sinuses evident but not deep, pronotum arching very slightly and almost evenly to apex, which is produced only as far caudad as the basal angle of terminal areole of fore wings. Anterior oblique white vitta is somewhat obscured above by the olivaceous coloring that borders it anteriorly, meets the lateral margin behind the middle and broadens somewhat as it approaches it. Mid-dorsal translucent spot conspicuous, rectangular, wider than deep, not extending below compression. Anteapical white vitta broad, distinct, vertical. Pronotal surface otherwise blackish brown, darkest bordering the vittæ, along carina and at apex.

Body beneath testaceous.

Fore wings clear hyaline, veins contrastingly dark, the terminal areole large, its sides diverging at more than a right angle. Apex very slightly clouded, the terminal areole scarcely invaded.

Legs testaceous.

Length 5.60 mm.

MALE: Like the female, a little smaller and even less elevated. Colors deeper.

Pronotum with the anterior oblique vitta quite obliterated superiorly by the invading olivaceous brown. In some specimens this olivaceous tint becomes lost, the forward pronotal surface being grayish brown, in certain examples which I have tentatively associated with the allotype here are correctly so associated.

Body beneath black, the genital segments flavous, tips of the organs black.

Fore wings as in the female, their tips slightly more infuscated.

Legs testaceous, fore femora above black.

Length 5.5 mm.

Holotype ♀. Litchfield, Conn. VII/1/'20. Taken on *Quercus rubra*.

Allotype ♂. Litchfield, Conn. VI/22/'20. Taken on *Quercus coccinea*.

Both in my collection.

It has been suggested above that this prettily marked species is perhaps most nearly like *C. intermedius* Emmons. It is however distinguished from the paler forms of the female of that

species as here understood by being much more contrastingly patterned between the fore and hind parts of pronotum, less elevated, fore wings clearer hyaline, and lacking the deep foveate character of the dorsal compression which marks that species whatever its color variation. The males are more difficult to differentiate satisfactorily, though here again the foveate impression below the mid-dorsal compression is not so deep, and the broad dark humeral bands are lacking. Figures of both holotype and allotype are herewith presented.

Cyrtolobus griseus Van Duzee.

This species was described from three females taken at Effingham, Kansas, and is rather widely distributed in the middle west. The length of a female of average size from Illinois, which Mr. Van Duzee has kindly compared for me with the type, and which he pronounces the counterpart of a paratype taken with the type, is 6.25 mm., thus materially exceeding the average length, 5.60 mm., of the female of *C. cinereus* Emmons, or as determined in this paper *C. pallidifrontis* Emmons, with which it was compared in the original description; but while it doubtless averages larger than that species, some specimens at hand are of substantially the same size. All seen by me, however, have their legs wholly pale, and the arch of the pronotum, while low, decidedly greater and higher anteriorly than in that species. Examples occur in which the gray of the pronotum back of the anterior vitta is somewhat reddish, sometimes decidedly so. Such specimens approach in general appearance many northern examples of a species which I am not able to distinguish satisfactorily from one taken in the south, hereinafter described under the name *C. rufulus*, typically smaller and from typical *griseus* evidently distinct. It may be that these seeming intermediates are themselves entitled to specific rank, but I do not feel justified in so recognizing them at present.

Regarded as a member of the group which includes the three following species as well, *griseus* may be distinguished from the others as decidedly the greatest in size; and from the species most nearly approaching it in that particular, *pallidifrontis* Emmons, it differs in having all the femora wholly pale, and the fore wings immaculate except for a slight apical cloud.

Cyrtolobus pallidifrontis Emmons and *cinereus* Emmons.

C. pallidifrontis Emmons was figured without description, but with what appears to be an excellent representation of the female, in the Natural History of New York, Part V. Agriculture, Plate XIII, Fig. 7. Its recognition, however, has usually proven to be a stumbling block. The suggestion is here made that this species is that which stands in most collections under the name *cinereus* Emmons. Students of the group have generally recognized as that species a form widely distributed in the north and east with unusually low pronotum and fore wings maculate at their middle, and so assigned by Van Duzee in his "Studies"; but there is no doubt in my mind that the species so recognized is *pallidifrontis* Emmons, and in all probability not *cinereus* Emmons. For several years I have had a series of specimens which, following the customary recognition of *cinereus*, have stood in my box under that specific name, with the special label *pallidifrontis* placed at their side, so closely did they conform in shape, coloring and pattern with the figure of the latter cited above; and recently I discovered a grayish specimen among the material acquired by the United States National Museum from the Fitch collection with a narrow green label bearing the name *pallidifrontis* in handwriting. Emmons states (p. 153, Footnote) that his account of the Membracidae is based upon Fitch specimens. This specimen, upon direct comparison, agrees almost exactly with Emmons's figure in form, shading and markings, including the unusually broad anteapical vitta, slightly exaggerated in the figure. It also agrees substantially with the above mentioned specimens in my box. Notwithstanding that it is a little less gray, it accords so closely with the figure that it may be the actual specimen from which it was drawn! I believe the probabilities are in favor of that presumption. In that case this specimen, bearing also a label with the number 11,763, has a plausible claim to be regarded as the type of *pallidifrontis* Emmons, and can at least be chosen as its lectotype, as is here done. It follows that what we are calling *cinereus* should be known as *pallidifrontis*. Under the name *cinereus* Emmons this species has been described by Van Duzee on page 91 of his "Studies" (ante), and in greater detail by Funkhouser on page 276 of his "Biology of the Membracidae

of the Cayuga Lake Basin",¹ so a further description is not presented here, other than to point out that the above mentioned National Museum specimen has a pale pinkish wash on face and metopidium, and a reddish tint on pronotum between the posterior black border of oblique vitta and anterior black border of ante-apical vitta, these tints not shown in the figure. The specimen also has reddish spots above the metopidian frontal callosities, indicating the beginning of obsolete supra-humeral bands, a broadening downward of the pale anterior vitta to the lateral margin, and a broad but very shallow mid-dorsal translucent spot. The fore wings are clouded at base, middle, and very broadly at apex, entirely infuscating the terminal areole and encroaching on its neighbors. The black of the femora above, characteristic of this species, is shown in the figure.

Now as to whether the two names are of one species. A comparison of the two figures in question, both given on Plate 13, assuming them to represent the same sex, as well as the inapplicability of the description of *cinereus* to the figure of *pallidifrontis*, render that hypothesis untenable. Nor is it supported on the assumption that the figure and description of the former were drawn from a male specimen. I have never thought that Emmons's figure of *cinereus*, or his brief description itself, accorded at all well with either sex of the species generally assigned to it. He describes particularly (p. 156), and figures graphically (Fig. 3), a brown insect with a broad lighter brown sagittate mark on the anterior dorsal surface of the pronotum. What we know as *cinereus* would, in the female at least, hardly be called brown, nor does it accord in color with his figure. Since the males are frequently brownish, and often have the mid-wing maculation obsolescent, I have given special consideration to the possibility that Emmons had a male specimen of this (or some other) species before him in describing and figuring *cinereus*, but no specimen has been found by me to accord with either description or figure. As to the arrowhead mark, in the very large aggregate of specimens of both sexes which I have examined, literally hundreds, I have never seen this matched, hardly approached. The conspicuous maculation of the fore wings of the female of

¹ Cornell Univ. Agri. Exp. Station. Mem. II. 1917.

this species (*pallidifrontis*) is not referred to in the brief description of *cinereus*. My conclusion is, *pallidifrontis* Emmons is a good species, identifiable, not synonymous with *cinereus* Emmons, and that we do not know *cinereus*.

It should be noted that in eastern New York and New England *pallidifrontis* is usually more grayish than red, but that with the grayish form reddish specimens also are found, the reddish ones, however, predominating in western New York, Pennsylvania, and Illinois. But these are clearly all one species. For convenience of reference figures of both sexes of this very low and elongate species are hereto appended (Plate IV, Figs. 25, 26), the specimens having been taken at Litchfield, Conn.

Cyrtolobus gramatanus new species.

The following new species belongs to the group having fore wings maculate at the middle. From *pallidifrontis* Emmons, as I recognize that species (above), it differs in the female by being smaller, and arching proportionately and actually higher anteriorly, the crest from frontal view higher above humeral plane, and the depth of the mid-dorsal translucent spot therefore greater; in having the pronotum back of the anterior oblique vitta usually bright red; in the total absence of black from the femora of both sexes; and in the less squared terminal cloud of fore wings. Its type of ornamentation is that of *pallidifrontis* as figured by Emmons, but contrary to the character of pigmentation disclosed by a large series of that species, the colors are much clearer and more sharply defined—not at all confluent as they frequently are in *pallidifrontis*. It is further distinguished from that species by its coarser punctuation, its surface therefore rougher than in *pallidifrontis*, which has a rather silvery sheen. In the male it differs particularly in being proportionately higher arched, and its coloring and pattern are more usually very much as in the female, instead of commonly black or brown as in that species. In fact, it is not very closely related to it, being here compared with and differentiated from it because both have the fore wings maculate at middle. Figures of a male and female of this new species, taken *in copula*, are herewith presented, and their description follows. The name selected was that of the Chief of the Indian tribe which originally had as its home and hunting grounds

that part of the country where I have found this species most abundantly, to-wit, the type locality.

Cyrtolobus gramatanus, new species. (Plate IV, Figs. 27, 28.)

FEMALE: Rather small, moderately arched, its coloring more or less sharply contrasted by delimiting black lines; its fore wings strongly maculate at base, middle and apex with brown.

Face testaceous, usually immaculate and washed with rose, sutures distinct, clypeus very little produced.

Pronotum arching moderately, commencing its even curve well forward immediately above humeri, the middle of dark space between incidence of anterior vitta on carina and mid-dorsal spot also well forward, intersected by an imaginary vertical line arising from posterior point of post-humeral sinus, the summit of the crest attained at the anterior angle of the mid-dorsal translucent spot. Metopidium yellowish testaceous over humeri, more grayish centrally, with black carina. From callosities over eyes arise two broad brick-red bands curving over humeri to rear of post-humeral sinuses. Humeri themselves are very often brick-red. Anterior white spot on carina above post-humeral sinus small, but usually present. Anterior oblique vitta arising from lateral margin forward of middle, directed toward dark space posterior to anterior white spot on carina, and rarely connected with the latter by irregular white maculations, usually abruptly terminating about half way to summit, though occasionally showing at this point an indistinct horizontal forward extension which rises again to anterior white spot; this vitta bordered behind and interruptedly before by broad black lines. Anterior to this vitta the pronotum is more or less maculate with white. Mid-dorsal translucent spot conspicuous, broad and rather shallow. Anteapical white vitta erect, exceptionally broad, especially on carina, bounded before by a broad black line; the space between these vittæ bright red. Apical pronotal process beyond the vitta usually rather short, blunt, and testaceous with brown punctures, attaining middle and at times apex of terminal areole of fore wings.

Body beneath pale yellowish testaceous.

Fore wings hyaline, clouded at base, middle and apex with brown, the cloud broad and distinct at middle, rounded at apex, covering terminal areole.

Legs, including femora, pale yellowish testaceous.

Length 5.20 mm.

MALE: Like the female, but lower.

Face wholly testaceous; the reds of crest becoming dark brown or black on metopidium, on central pronotum very dark red; the vittæ lack the delimiting black lines, and so are less sharply contrasted, but the anteapical vitta is usually broad, as in the female.

Body beneath and abdominal segments laterally black, ventrally pale testaceous.

Fore wings hyaline, apical cloud rounded, cloud at middle sub-obsolete. Legs, including femora, pale testaceous.

Length 5. mm.

Holotype ♀. Bronxville, N. Y. VI/14/'14. Taken on *Quercus platanoides*.

Allotype ♂. Same locality, date and host plant. Holotype and allotype taken in copulation. Both in my collection.

Paratypes: A large series of both sexes from the type locality are before me, which may be regarded as paratypes.

Besides those taken by me for several years past at Bronxville, Westchester County, N. Y., mostly on *Quercus platanoides*, including several copulating pairs, I have seen many specimens from Long Island, N. Y., and the lower Hudson River region and from New Jersey, as well as one female in Mr. Olsen's collection from Rutland, Vermont.

The possibility has been considered and rejected that this species might be that figured and described as *cinereus* by Emmons, not yet recognized by me. While it is common in at least parts of New York, from which State most of Fitch's and Emmons's material probably came, it does not correspond with either the description or the figure of that species. For instance, it lacks the dorsal sagittate mark which is both described and represented in the figure of *cinereus* (Nat. Hist., N. Y., Agri. V, Plate XIII, Fig. 7), and in comparison with the outline there given has a much greater pronotal arcuation. There seems to be no other described species to which it may be referred, and it is therefore presented as new.

Cyrtolobus rufulus new species.

The following new species, as its name implies, is a reddish one, founded on a few female examples taken in Alabama, of less than medium size with rather low pronotum, notable in having its anterior half a lighter shade of red than the posterior half, the division along the line of an oblique vitta which is absent, as are all other markings. However in the specimen chosen as holotype and figured herewith the oblique vitta is indicated not only by

the abrupt transition from one shade of red to the other, but by a distinct thinning of the red wash on the yellowish ground color of that region, particularly on its lower half. Another outstanding character of these specimens is the strong triangular maculation of the middle of the fore wings, preceded by a pinkish wash, in this respect recalling *pallidifrontis* Emmons as here recognized. But the legs are always wholly pale, lacking the shining black of the femora above, so characteristic of that species in both sexes. At the same locality numerous pinkish specimens were taken of similar form, though seeming to average a little smaller, with both anterior oblique and anteapical vittæ present, frequently outlined with black, as well as with a distinct mid-dorsal pellucid spot, and with fore wings quite devoid of maculation at their middle. At first I regarded these as distinct from the above; but a considerable series seems to show every gradation between the two forms, including vittate specimens with maculate fore wings, and those with the vittæ obsolete and the fore wings clear at their middle. No structural character has been discovered by me by which they may be specifically separated, and I am constrained to regard them as one. The description of the selected types of both sexes follows, their figures being appended hereto.

Cyrtolobus rufulus, new species. (Plate III, Figs. 19, 20.)

FEMALE: Under medium in size, arch low, surface with a smooth appearance due to its unusually small even punctures; reddish, darker on posterior half; in holotype without vittæ or mid-dorsal translucent spot, and with fore wings triangularly maculate at middle.

Face yellowish, strongly suffused with red; clypeus little produced, rather broad and moderately incurved, its yellowish ground color also washed with red, but less strongly.

Metopidium hardly receding from plane of face till level with top of humeri; thence pronotum retreats almost horizontally to above post-humeral sinus in holotype, and then rises again, the rise being more gradual in most specimens from top of metopidium to low summit back of post-humeral sinus, thence unevenly sloping downward, with sinuations at positions of mid-dorsal translucent spot and anteapical vitta, both lacking, to tip, which attains middle of terminal areole of fore wings. Anterior half of pronotum overspread with dull red back to position of an oblique vitta, in the holotype that vitta indicated by a broad triangular yellowish spot at lateral margin, and supra-humeral bands by obscure subtending pale lines; the whole posterior half rich mahogany red without pattern, but with a moderate mid-dorsal compression.

Body beneath yellowish testaceous, sides of abdomen encarnadined.

Fore wings marked with blackish brown clouds at base, middle and tip, that at middle broadly triangular preceded by a pinkish area, that at tip rather round, covering terminal areole and apical third of cell above it.

Legs wholly yellowish testaceous.

Length 5.60 mm.

MALE: Smaller and much lower than the female, though still distinctly arched; vittæ present.

Face and anterior half of pronotum suffused with red as in the female.

Metopidium with supra-humeral bands more evident, but obscure, the surface above and sides of pronotum anterior to oblique vitta more or less mottled with numerous small black areas, the triangular pale area at lateral margin evidencing the oblique vitta whitish instead of yellowish, its summit indicated by a pale spot on carina. Mid-dorsal pellucid spot obscure except on carina, the compression moderately deep, and the anteapical vitta white, vertical, broad; very narrowly bordered anteriorly with black, before which the pronotum is bright red. Tip brownish red, a little exceeding the angular base of terminal areole of fore wings.

Body beneath testaceous with more or less black anteriorly and on sutures, abdominal segments on sides black bordered with red, genital plate with tip and styles black.

Fore wings maculate as in female, but much less heavily at middle.

Legs wholly pale.

Length 5 mm.

Holotype ♀. Hazen, Ala. IV/2/'21. Taken on *Quercus alba*.

Allotype ♂. Same locality. V/2/'23. Taken on *Quercus minor*. Both in my collection.

Paratypes: Same locality. Several males and females, in all about fifty, a great majority of which are those with vittæ prominently present, are before me; and if, as I believe, they are all of the same species, they may be regarded as paratypes.

Were I challenged with respect to assigning the above male to the holotype as of the same species, my excuse would be the lame one that similar males were taken commonly with the corresponding vittate females at the same place, though not noted in copulation, and that it looks as though it belonged with it. In the absence of proof to the contrary, I regard the presumption sufficiently great to warrant my so assigning it. But the real difficulty is presented by those females that have the vittæ and mid-dorsal pellucid spot fully developed. Where the vittæ are outlined with black, as often occurs, I find considerable trouble

in pointing out characters to distinguish them from certain females of *gramatanus* Woodruff (ante), the seemingly constant presence of the middle cloud in the fore wings of the latter not being sufficiently diagnostic, as such a cloud is often present or indicated here. It is true that this southern species is a pinkish red insect even when patterned like the northern more grayish *gramatanus*, and compared with specimens of the latter from its type locality seems to average lower, longer with less contrast between color of pronotum before and behind middle, the anterior oblique vitta usually sharply angulated at its middle when considered from its front margin instead of actually interrupted there as in *gramatanus*, which latter seems to present a larger and more conspicuous mid-dorsal translucent spot. Yet specimens are found in which these slight differences tend to disappear; and were it not that the non-vittate forms, with which these seem to merge, are so thoroughly unlike *gramatanus*, I would hesitate to separate them from that species. In order to exemplify what seems to be the range of variation in the species at its type locality I append figures of another specimen of each sex (Figs. 17, 18) which will show the approach toward *gramatanus* above noted. Descriptions of these follow:

FEMALE: Face reddish yellow, punctures of frons black.

Metopidium at base and on central third to summit testaceous yellow, centrally with black punctures. Sides of metopidium reddish yellow, with broad deeper red bands from callosities above eyes running up over humeri. Between humeri and anterior oblique vitta testaceous heavily mottled with black, that vitta testaceous white, arising from before middle of lateral margin, broad at origin, vertical to a point close to anterior lower angle of broad squarish mid-dorsal translucent spot, thence narrowly and irregularly forward, and again rising and expanding on summit of crest over post-humeral sinus. This vitta is bordered posteriorly with black, back of which the pronotum is an even rich dark red interrupted by the vertical white anteapical vitta, which expands forward on crest and is bordered before and broadly behind with black. Tip testaceous.

Body beneath black anterior to abdomen, otherwise reddish testaceous.

Fore wings slightly enfumed, fuscous at base, on veins at middle, with rounded terminal cloud covering the terminal areole and apex of cell above it, but not extending up along margin.

Legs pale.

Length 5.5 mm.

MALE: Like the female above described, but smaller.

Pronotum with anterior oblique vitta at summit of crest, and mid-dorsal translucent spot, much reduced; black borders of anteapical vitta obsolete, tip wholly red.

Fore wings with pronounced triangular cloud at middle; often almost or quite devoid of it. Terminal cloud as in the female but darker, in a series very variable in extent and definition.

Legs pale; basal portion of femora in front (not above) with a more or less continuous and broad brownish stripe, often lacking.

Length 4.80 mm.

These were taken at the type locality IV/9/'21 and V/5/'23 respectively, and are in my collection, there distinguished as "*form ornatulus*" from the typical non-vittate form. The pronotal sinuation of both figures of the female presented is individual, though the species has a tendency toward it at those parts of the carina usually marked with pale; most specimens showing an even arc to tip.

In addition to the material from the type locality I have examined several specimens from New Jersey, Staten Island and Long Island, N. Y., one female from Ocean Sp., Miss. (Funkhouser Coll.), and one bearing label "Topeka Ks. Popinoe", one from Louisiana and a pair from Texas in the United States National Museum. Extensive material from Illinois, Wisconsin, Minnesota and S. Dakota has also been seen, which I range with this species, though with some hesitation. If correctly placed, it would appear that northern specimens average somewhat larger and less pinkish than those from the south.

This group, consisting of *griseus* Van D., *pallidifrontis* Emm., *gramatanus* Woodr., and *rufulus* Woodr., presents more difficulties than any other in the genus. Typically the species are severally abundantly distinct; but specimens are continually coming to hand which combine in bewildering fashion the characteristics in pattern, size, color, etc., of two or more of them, so that their recognition is problematic. In all the structure of clypeus and pronotum, as well as the pattern, is very similar, and the fine punctures of their surfaces give the effect of a sheen which is distinctive, not of one species, but of the group. In fact we have here a marked instance of the condition of the family as a whole,

the several genera made up of numerous forms whose characters seem to be somewhat in a state of flux. As classification has as its purpose not only the expression of such relationships as we find in nature, but also a terminology which we may conveniently use in the study of these several forms, the best we can do here is to recognize as so-called species those which exhibit outstanding differences, and grade those with them which seem to approach them most closely, bearing in mind as checks both locality of capture and host plant.

Cyrtolobus fuscipennis Van Duzee.

In *Cyrtolobus fuscipennis* Van Duzee we find an extraordinary range of color, particularly in the female, where the gamut runs from very dark red thickly overlaid with black, but not obscuring the vittæ, to pale whitish and creamy examples with the markings obsolete. In all phases of both sexes, however, in addition to the smoky wings, a somewhat variable though distinctive character, the tip of the pronotum behind the anteapical vitta seems to be almost always red in some degree, furnishing a fairly good specific mark in this otherwise well characterized species. The male has not heretofore been described. A figure of a specimen of that sex is hereto appended, and its description follows:

Cyrtolobus fuscipennis Van Duzee. (Plate VI, Fig. 49.)

MALE: Face crimson red. Clypeus narrow, produced below genæ.

Metopidium very dark brown overlaid with black. Pronotum low, highest at mid-dorsal translucent spot, the anterior border of which slopes almost parallel with anterior oblique vitta; color dark red, including tip. Anterior vitta angulated caudad at its middle, broad, dull white, broadly bordered in front and behind with black, as is the broad, white and vertical anteapical vitta.

Body beneath black.

Fore wings far exceeding pronotum, dark smoky, very broadly and darkly infuscated at apex, the cloud covering terminal areole and half of adjacent cells.

Legs pale, femora above black.

Length 5.50 mm.

Allotype ♂. Litchfield, Conn. VI/9/'21. In my collection. Taken on *Quercus alba*.

Of this species I have been fortunate in taking many pairs in copulation. As stated above, its pigmentation is subject to great variation, specimens of the female frequently showing no trace of black, being wholly red, or brown, or pale, with however the usual vittæ. The anterior margin of the terminal cloud of the fore wings is usually sharply defined in a straight forward tilted line, against which they present their clearest area.

Cyrtolobus togatus new species.

The following new species is a pretty little pink and yellowish one, and seems to be fairly common in the type locality (Hazen, Ala.), where it is associated with willow oak, doubtless as its preferred host plant. I have found it in great abundance on that tree, and believe that the few found on other species of oak are flown specimens. Figures of the holotype and allotype are appended hereto, and their description follows:

***Cyrtolobus togatus*, new species.** (Plate V, Figs. 35, 36.)

FEMALE: Small, slender, little elevated, pronotum highest back of post-humeral sinus; punctuation rather fine, moderately shining with somewhat silky or oily sheen.

Face greenish with black punctures; clypeal sutures, margins of loræ and genæ, and erect band adjacent to eyes, roseous. In many specimens this rosy wash is lacking, the black punctures furnishing the pattern. Clypeus produced, incurved. Eyes rosy.

Pronotum attains basal angle of terminal areole of fore wings. Green of face and bands adjacent to eyes continued on base of metopidium. A broad light yellow band rises from greenish base of metopidium at the middle to the slightly indicated carinal sinus at its summit, its margins parallel from front view, continued thence diagonally to mid-lateral margin of pronotum, in most specimens at hand bordering a narrow, irregular whitish anterior oblique vitta. Two broad pinkish rufous bands, arising at callosities of metopidium over eyes, border the central yellowish band, crossing over the humeri, where they become lost, or in some examples continuing rearward, indefinitely overspreading the yellowish area anterior to the oblique vitta. A narrow yellow marginal band from base of metopidium includes the humerus and post-humeral sinus and merges in the yellowish area forward of the anterior vitta. Carina yellow from base of metopidium to vague anterior sinus, thence narrowly dark to near acute apex, but interrupted by pale of mid-dorsal translucent spot and anteapical vitta. Pronotum darker rufous back of indicated oblique vitta, the latter obsolete in the holotype, but its position indicated by contrasting colors of pronotum

before and behind it. Mid-dorsal translucent spot squarish. That and anteapical vitta not strongly defined.

Body beneath green.

Fore wings hyaline, rufous at base, apex with dark cloud covering terminal areole; veins pale.

Legs pale testaceous.

Length 4.50 mm.

MALE: Like the female in size and form, but coloring much more pronounced.

Face yellowish testaceous almost wholly concealed by dark rufous.

Pronotum bright chestnut brown usually, in allotype and occasional specimens black, the chestnut brown discernible at the edges of the vittæ, with yellowish white as follows: Carina on metopidium from base to anterior sinus; broadly over humeri along lateral margin to junction with anterior oblique vitta back of middle; that vitta broad at lateral margin, rising toward anterior sinus but extending but little more than half way; mid-dorsal translucent spot varying much in size and definition, in allotype small but distinct. Anteapical vitta rising vertically, distinct and parallel-sided in allotype, usually broadening at summit.

Body beneath and abdominal ventral segments black.

Fore wings hyaline, base and veins dark chestnut red; apical cloud black, squared anteriorly.

Legs pale testaceous, femora above blackish on basal two-thirds.

Length 4.50 mm.

Holotype ♀. Hazen, Ala. IV/13/'21. Taken on *Quercus phellos*.

Allotype ♂. Same locality date and host plant. Both in my collection.

Paratypes: Fourteen males and twenty-three females, all taken by me at the type locality in the spring of 1921 and 1923, may properly be regarded as paratypes.

The holotype and allotype were taken by me in copulation, and all were taken by beating *Quercus phellos* except two, which were found on *Quercus minor*. In the large amount of material which has passed through my hands I have seen no examples from any other State than Alabama except a pair from Louisiana in the collection of the National Museum; but doubtless it will be found throughout the south wherever *Quercus phellos* occurs in abundance.

The coloring of the females is not sharply contrasted, the roseous and yellowish shades of the pronotum tending to merge into a unicolorous tint. But the broad rufous bands over the

shoulders are quite conspicuous and constant, and offer a good diagnostic mark.

Cyrtolobus flavolatus new species.

Only four specimens of the following very distinct little species have been seen by me, three taken by Mrs. A. T. Slosson in Pennsylvania, and one by Mr. Davis on Long Island, N. Y. It is a small reddish brown and yellow form, with low pronotum, strongly suggesting in its markings *Ophiderma flavicephala* Goding, but in structure a member of this genus. Figures of both sexes are appended hereto, and their description follows:

Cyrtolobus flavolatus, new species. (Plate V, Figs. 37, 38.)

FEMALE: Face pale yellow, broader between eyes than long, clypeal sutures distinct, clypeus convex between loræ and produced below.

Pronotum low, sparsely hairy; carina on metopidium distinct, rising very moderately from anterior sinus, highest about middle, sloping evenly to apex, which barely reaches as far back as basal angle of terminal areole of fore wings. Mid-dorsal compression rather deep. Color light reddish brown, with yellow distributed as follows: Base of metopidium narrowly margined with yellow, this color rising at its middle in a band as broad as distance between ocelli to its summit, and extending over humeri in broad and slightly widening bands along lateral margins two-thirds the length of pronotum, their apical extremities arcuated abruptly from just below mid-dorsal compression to lateral margins. The usual anteapical vitta also yellow, narrow, descending slightly caudad. No trace of an anterior oblique vitta.

Body beneath pale yellow.

Fore wings reddish at extreme base, narrowly pale fuscous at terminal margin, the fuscous cloud slightly invading apical cells, veins pale testaceous. Otherwise hyaline.

Legs pale yellow.

Length 5.5 mm.

MALE: Like the female, but even more depressed; colors brighter, more sharply contrasted.

Pronotum a darker reddish brown, marked with yellow as in female, the callosities on metopidium above eyes conspicuously black.

Body beneath, and apex of clypeus and loræ, black.

Fore wings like those of female, but veins and cloud much darker, the fuscous margin covering about half of terminal areole.

Legs pale, fore femora above a little brownish.

Length 5. mm.

Holotype ♀. Delaware Water Gap, Penn. VII/1/—(Mrs. Slosson). In collection of Mrs. A. T. Slosson.

Allotype ♂. Same locality. No date label. (Mrs. Slosson.) Also in Slosson collection.

Paratype ♂. Same locality. No date label. (Mrs. Slosson.) in my collection, and ♀ from Half Way Hollow Hills, Long Isand, N. Y. VII/2/'15. (W. T. Davis.)

The depressed form of this species, particularly in the male, suggests the genus *Ophiderma*, but the strong carination and the compression of the pronotum posteriorly characterize it as a *Cyrtolobus*. Although I have sought for it in the type locality, as well as in the exceedingly large amount of material which has passed through my hands, the above specimens are all that I have seen. The female (holotype) bore the label "*Cyrtolobus lateralis* V. D. var.?" But it is not close to *lateralis* Van Duzee. While marked somewhat as in that species, these specimens are hardly a quarter of its size in bulk, and the fore wings are clear, while those of *lateralis* are conspicuously clouded throughout with dark smoky. Besides, *lateralis* was assigned by Van Duzee to *Xantholobus*, in which sub-genus I think it belongs, whereas this little species is excluded from that sub-genus by the lack of bulbous inflations fore and aft of the mid-dorsal compression, the pronotum tapering evenly to apex with hardly a suggestion of cysts. It is unquestionably entitled to specific recognition.

Cyrtolobus inermis Emmons.

This is here referred to for the purpose of calling attention to the fact that there seem to be two color forms of the male—the polished black one, described by Van Duzee in his "Studies", and a light brown one with like white vittæ. There is also apt to be present in both black and brown forms a small mid-dorsal translucent spot. It is just possible that the black form indicates greater maturity; but of that there is no evidence. Apparently these color phases parallel those in the male of *C. ovatus* Van D., before referred to.

Cyrtolobus (Atymna) simplex Van Duzee.

So far as known to me, the male of this species has not yet been found and recorded. Its habitat is in our southwestern

states, and a report of the capture of a copulating pair is very desirable, that this gap in our knowledge of the group may be definitely filled.

Cyrtolobus (Atymna) castaneae Fitch.

This opportunity is availed of to record my conviction, based upon material which I have collected, that *viridis* Emmons as described and figured by him, and which still holds a place in our List, is certainly one of the color forms of *castaneae* Fitch, as has been suggested by other authors. With the practical annihilation of our chestnut trees the future persistence of this species is problematical, although it does at times subsist on oaks.

Cyrtolobus (Atymna) helena Woodruff.

This species, described in the Journal of the New York Entomological Society, XXIII, p. 44, Plate IV (1915), was found in comparative abundance on *Quercus platanooides (bicolor)* at Bronxville, N. Y. Although still to be found on its host plant at that locality, no example that has been taken elsewhere has been seen by me except from New Jersey, and the following two: A male taken by Dr. H. H. Knight in Ramsey Co., Minn., July 20, 1920, and a female, also taken by him at Faribault, Minn., June 12, 1922. These two specimens are typical, having been compared by me with holotype and allotype respectively, except that the female has very interesting sub-obsolete indications on the crest of the dark markings of the male; and their capture in a State so far distant from their type locality makes it probable that the species will subsequently be found upon its favored host plant throughout our northeastern states.

It has been suggested that this species does not belong in *Atymna*, the summit of the crest being back of the humeri as in *Cyrtolobus s. str.* Notwithstanding the force of that suggestion, I still regard its position in the genus as very close to *Atymna querci* Fitch, with the two sexes of which it closely corresponds in general coloring and form. It may be pointed out that, except in *Atymna castaneae*, the form of the pronotal arch of the female in the several species generally assigned to this sub-genus in order to indicate their affinities in the group, tends to conform with that

found in *Cyrtolobus* proper; the females of all of the species so assigned being green and without pattern, though in *castanea* ranging from that color to almost black. The slightly more rearward summit of the pronotum in the male of *helena* is in my opinion not sufficiently important to warrant the ignoring of the many other correspondences which point to its alignment in classification with the special group which includes *A. querci* Fitch.

Cyrtolobus (Atymna) querci Fitch.

In this common species color variation in the males is of frequent occurrence. Copulating examples of this sex in some sections are regularly pink and yellow, instead of the more typical black and yellow; the pattern, however, continuing normal.

Cyrtolobus (Atymna) inornata Say.

This distinct little species, one of the first in the genus to be described, is remarkable in having the two sexes alike in coloring, both green. No satisfactory character has yet been pointed out for distinguishing the female from the corresponding sex of *querci* Fitch, and though it most probably averages smaller, I suspect that the two species are commonly confused in collections, including my own, except in those cases where the females have been taken in copulation.

Cyrtolobus (Evashmedea) concinnus Goding.

This dorsally sinuate and elongate species is another of our southwestern forms, concerning which there seems to be no confusion.

Cyrtolobus (Xantholobus) muticus Fab.

This is a widespread species of our eastern and southern states, which is generally recognized. No occasion for its discussion here is present.

Cyrtolobus (Xantholobus) lateralis Van Duzée.

The species *Cyrtolobus (Xantholobus) lateralis* Van Duzée was based upon one female taken at Ithaca, N. Y., and well described in the "Studies" (ante). As the male has not been recognized in

the literature, a figure of an example of that sex is here presented, together with a description.

Cyrtolobus (*Xantholobus*) **lateralis** Van Duzee. (Plate VI, Fig. 50.)

MALE: In form like the female, but a little smaller, the swollen posterior cyst very characteristic.

Face black, heavily marked with yellowish testaceous, including clypeus above its inflexed process.

Pronotum jet black, base of metopidium yellowish testaceous, lateral margins to below posterior cyst, as in the described female, and broad vertical anteapical vitta, testaceous white.

Body beneath black.

Fore wings on basal half and broadly at apex dark fuscous, including veins; otherwise smoky hyaline, not nearly so enfumed as in the female.

Legs pale, femora above black.

Length 5.75 mm.

Allotype ♂. Litchfield, Conn. VI/22/'22. Taken on *Quercus alba*. In my collection.

I have taken but one other male, in the same locality, which is the counterpart of the one above described. A considerable series of females shows a gradation in pronotal coloring from pale rufous brown to very deep mahogany red, almost black, and a frequent abbreviation of the pale lateral margin to a narrow border not extending rearward beyond the post-humeral sinus, and occasionally wholly obsolete. The anteapical vitta, present in the male, is lacking in the female. The body beneath in that sex is much the color of the pronotum; but the abdominal segments are pale except the elongated ninth (either side of styles of ovipositor), which is light rufous, as are the legs, including femora. In the "Fitch material" at the National Museum is a female of this species impaled on a short ordinary pin with a number label 3112 underlined in red ink, and a narrow name label reading *C. nigripennis*. So far as I can discover there has been no publication under this name, in which case Van Duzee's name for this species is valid.

Cyrtolobus (*Xantholobus*) *inflatus* Van Duzee.

The male of this species has not yet been described, but it is known, and I understand that the description is presently forthcoming. It is another inhabitant of our southwestern states.

Cyrtolobus (Xantholobus) tumidus Walker.

Of this species I have no personal knowledge. It was described from Florida, and Dr. Funkhouser reports it from Mississippi also.

Cyrtolobus (Xantholobus) nitidus Van Duzee.

The species *Cyrtolobus (Xantholobus) nitidus* Van Duzee was based upon three females, one taken at Lakehurst, New Jersey, and although assiduous collecting in the type locality has been done in an endeavor to discover the male, it has resulted only in the acquisition of a few more females, most of which were taken on *Quercus ilicifolia*. They are substantially counterparts of the co-type taken on Staten Island, N. Y. by Mr. W. T. Davis. What is undoubtedly the male of this species, however, is a black specimen which is described below and figured herewith, taken by Mr. Chris E. Olsen on the south shore of Long Island, N. Y., the insect fauna of which region has a decidedly southern cast. A figure of the above co-type, now in the collection of the American Museum of Natural History through the generosity of Mr. Davis, is herewith presented on Plate V, Fig. 40, and the male above referred to is also figured in Fig. 39 of that plate.

***Cyrtolobus (Xantholobus) nitidus* Van Duzee. Plate V, Figs. 39, 40.-**

MALE: Black, low, shining, coarsely hairy, with the posterior swelling of pronotum characteristic of the sub-genus.

Face black, shining, coarsely and densely punctured, a narrow and sharp median channel from apex to clypeus, the latter strongly deflexed; a mahogany red spot at margin above each ocellus.

Pronotum black, shining, coarsely punctured, the metopidium depressed callosities lacking, but in their place smooth shining mahogany red spaces above inner corner of each eye. Mid-dorsal compression strong without translucent spot, succeeded below, and posteriorly by a pronounced bulbous swelling. Anteapical vitta white, vertical, crossing pronotum just before apex, the latter black, blunt, not reaching triangular base of terminal areole of fore wings.

Body beneath black anteriorly and on sides of abdominal segments. Otherwise pale testaceous.

Fore wings hyaline, their veins flavous, without terminal cloud, but basal three-fifths very heavily infuscated with blackish mahogany.

Legs testaceous white, the spines of posterior tibiae and tarsi black. Length 3.5 mm.

Allotype ♂. Bay Shore, Long Island, N. Y. VII/4-7/'12 (C. E. Olsen), in my collection.

This species is not often met with, and except for those from Lakehurst, N. J. I have seen but one female, collected at Bay Shore, Long Island, where the above male was taken, and another collected at Clayton, Georgia.

As must have been inevitable in the consideration of so difficult and confused a genus as the one under discussion, there are before me many forms which seem to be distinct and undescribed, but by reason of lack of adequate material or other cause impelling caution in determining their specific status, they are not assigned definitely for the present, and so are not considered in this paper. I have no doubt that several of them represent unrecognized species, and from my own experience think it probable that intensive collecting throughout our area will disclose many more forms hitherto undescribed.

In this group the female usually bears the more distinctive pattern, and for that reason, as well as the fact that that sex is ordinarily much the more abundant and long-lived, the several species are almost always founded upon a female specimen. Furthermore, as the males are apt to be very differently colored from the females with which they are properly associated, and at the same time similarly colored as between themselves in the several species, it is often difficult to assign correctly a specimen in hand. This renders it most important to take pairs in copulation. Their breeding season is very brief, and such pairs are found only occasionally; the several species are very local in their habits not being widespread even in a locality where found on their particular host plant in comparative abundance; and aberrant color forms occur frequently which are puzzling to place. These facts, among others, make the task of preparing a competent and exhaustive review of the genus one that requires, in our present state of knowledge, much time and intensive field study over our whole area.

When a species is recorded as rare, it should perhaps be understood as meaning rarely found. It is quite possible that some of our rarities find the inaccessible upper branches of their host plant

more to their liking than the lower ones, thus escaping observation and capture.

In my citation of paratypes I have usually indicated only such specimens as have been taken in the type locality, though reference has been made to undoubted specimens of the species under consideration taken elsewhere that have come to my attention. An effort will be made to distribute paratypes of the new species here described and discussed, when available, among the more important representative collections in the country.

EXPLANATION OF PLATES I TO VI.

All figures are enlarged eight diameters.

PLATE I.

- Fig. 1. *Cyrtolobus van* Say. Male.
- Fig. 2. *Cyrtolobus van* Say. Female.
- Fig. 3. *Cyrtolobus arcuatus* Emmons. Male. Allotype.
- Fig. 4. *Cyrtolobus arcuatus* Emmons. Female.
- Fig. 5. *Cyrtolobus dixianus* Woodruff. Male. Allotype.
- Fig. 6. *Cyrtolobus dixianus* Woodruff. Female. Holotype.
- Fig. 7. *Cyrtolobus aureus* Woodruff. Male. Allotype.
- Fig. 8. *Cyrtolobus aureus* Woodruff. Female. Holotype.

PLATE II.

- Fig. 9. *Cyrtolobus celsus* Van Duzee. Male. Allotype.
- Fig. 10. *Cyrtolobus celsus* Van Duzee. Female.
- Fig. 11. *Cyrtolobus funkhouserii* Woodruff. Male. Allotype.
- Fig. 12. *Cyrtolobus funkhouserii* Woodruff. Female. Holotype.
- Fig. 13. *Cyrtolobus fuliginosus* Emmons. Male. Allotype.
- Fig. 14. *Cyrtolobus fuliginosus* Emmons. Female.
- Fig. 15. *Cyrtolobus clarus* Woodruff. Male. Allotype.
- Fig. 16. *Cyrtolobus clarus* Woodruff. Female. Holotype.

PLATE III.

- Fig. 17. *Cyrtolobus rufulus* Woodruff. Male.
- Fig. 18. *Cyrtolobus rufulus* Woodruff. Female.
- Fig. 19. *Cyrtolobus rufulus* Woodruff. Male. Allotype.
- Fig. 20. *Cyrtolobus rufulus* Woodruff. Female. Holotype.
- Fig. 21. *Cyrtolobus intermedium* Emmons. Male.
- Fig. 22. *Cyrtolobus intermedius* Emmons. Female.
- Fig. 23. *Cyrtolobus gratiosus* Woodruff. Male. Allotype.
- Fig. 24. *Cyrtolobus gratiosus* Woodruff. Female. Holotype.

PLATE IV.

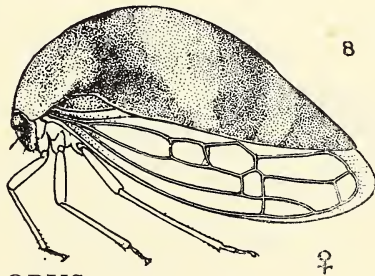
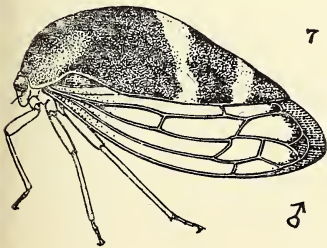
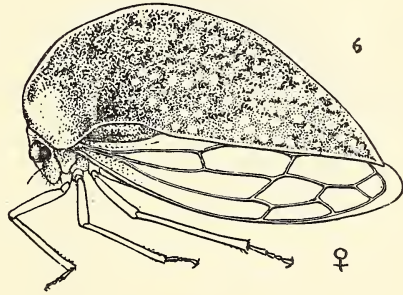
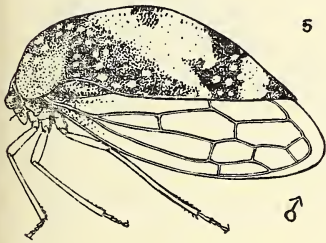
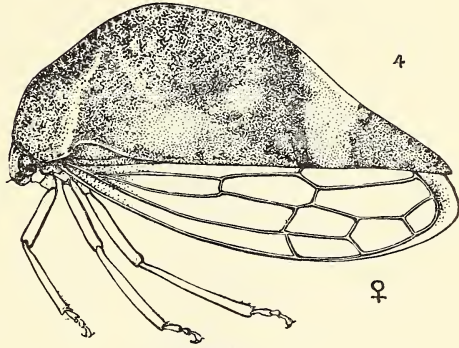
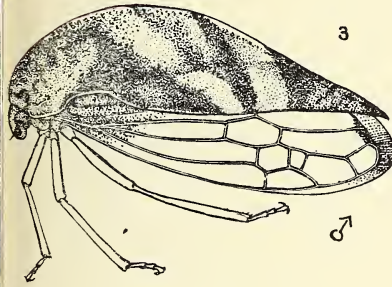
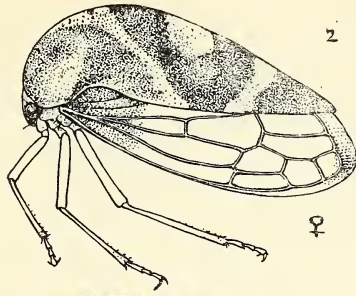
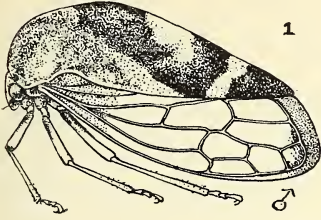
- Fig. 25. *Cyrtolobus pallidifrontis* Emmons. Male.
Fig. 26. *Cyrtolobus pallidifrontis* Emmons. Female.
Fig. 27. *Cyrtolobus gramatanus* Woodruff. Male. Allotype.
Fig. 28. *Cyrtolobus gramatanus* Woodruff. Female. Holotype.
Fig. 29. *Cyrtolobus pulchellus* Woodruff. Male. Allotype.
Fig. 30. *Cyrtolobus pulchellus* Woodruff. Female. Holotype.
Fig. 31. *Cyrtolobus parvulus* Woodruff. Male. Allotype.
Fig. 32. *Cyrtolobus parvulus* Woodruff. Female. Holotype.

PLATE V.

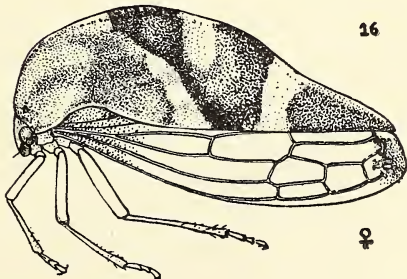
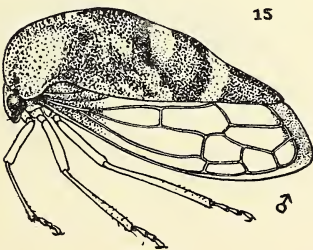
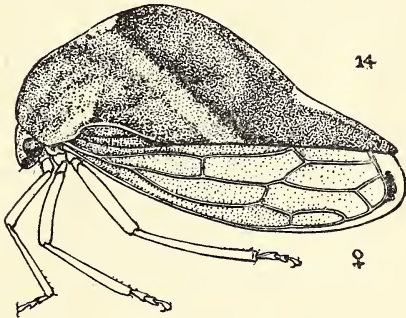
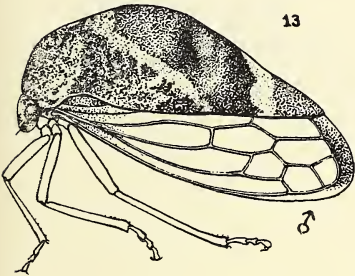
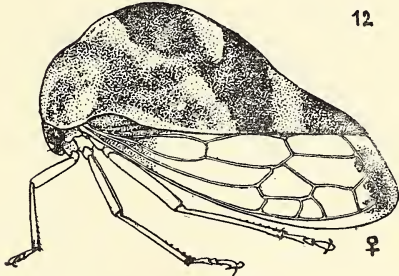
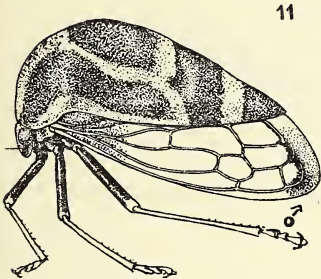
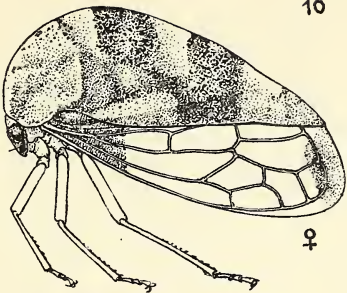
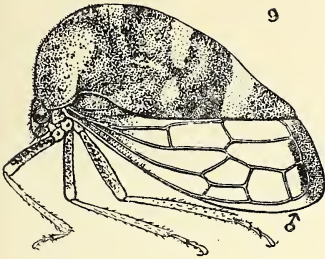
- Fig. 33. *Cyrtolobus puritanus* Woodruff. Male. Allotype.
Fig. 34. *Cyrtolobus puritanus* Woodruff. Female. Holotype.
Fig. 35. *Cyrtolobus togatus* Woodruff. Male. Allotype.
Fig. 36. *Cyrtolobus togatus* Woodruff. Female. Holotype.
Fig. 37. *Cyrtolobus flavolatus* Woodruff. Male. Allotype.
Fig. 38. *Cyrtolobus flavolatus* Woodruff. Female. Holotype.
Fig. 39. *Cyrtolobus nitidus* Van Duzee. Male. Allotype.
Fig. 40. *Cyrtolobus nitidus* Van Duzee. Female. Holotype.
Fig. 41. *Cyrtolobus ovatus* Van Duzee. Male. Allotype.
Fig. 42. *Cyrtolobus maculifrontis* Emmons. Male.

PLATE VI.

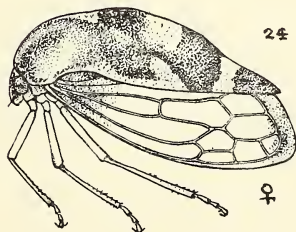
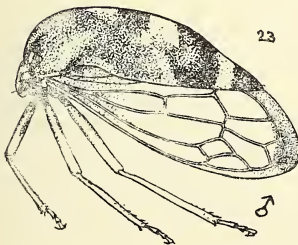
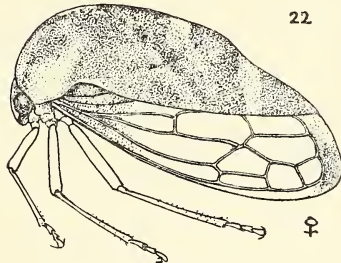
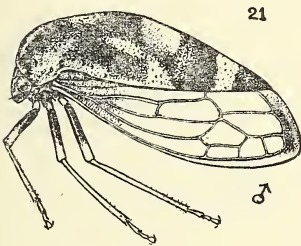
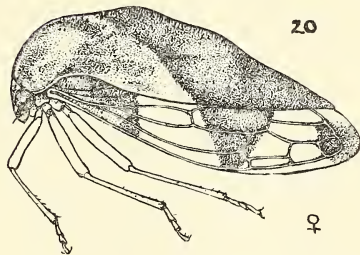
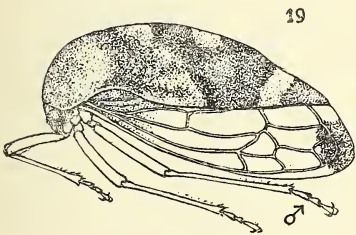
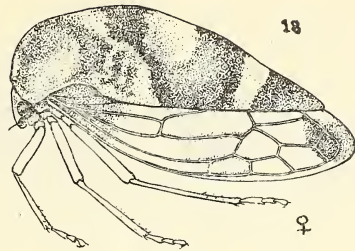
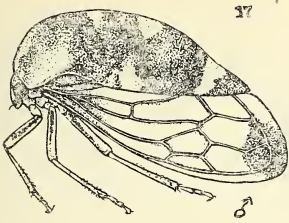
- Fig. 43. *Cyrtolobus fenestratus* Fitch. Male.
Fig. 44. *Cyrtolobus fenestratus* Fitch. Female.
Fig. 45. *Cyrtolobus discoidalis* Emmons. Male. Allotype.
Fig. 46. *Cyrtolobus discoidalis* Emmons. Female.
Fig. 47. *Cyrtolobus acuminatus* Woodruff. Male. Allotype.
Fig. 48. *Cyrtolobus acuminatus* Woodruff. Female. Holotype.
Fig. 49. *Cyrtolobus fuscipennis* Van Duzee. Male. Allotype.
Fig. 50. *Cyrtolobus lateralis* Van Duzee. Male. Allotype.



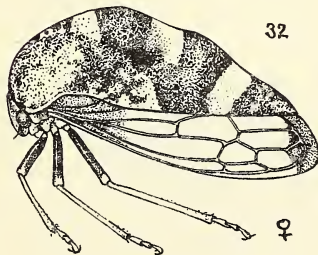
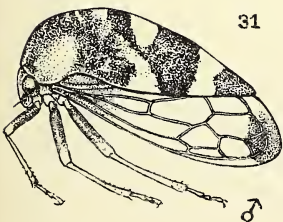
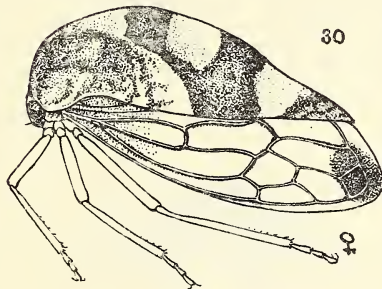
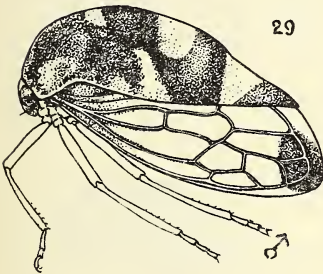
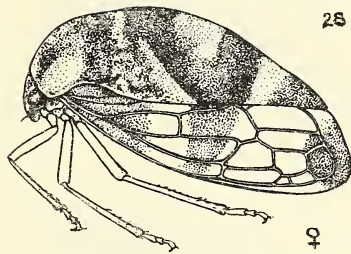
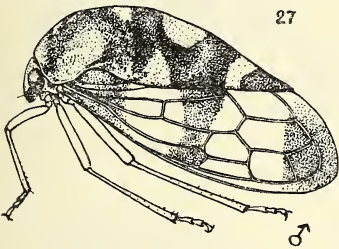
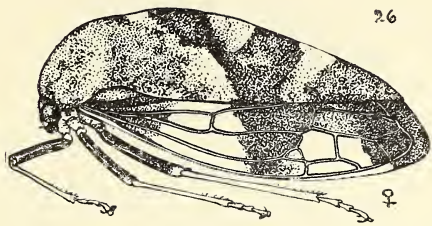
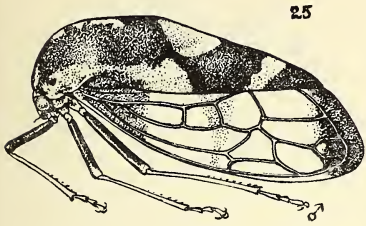
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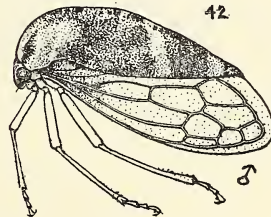
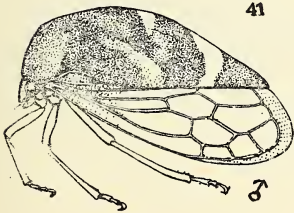
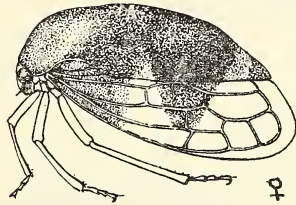
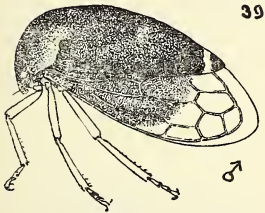
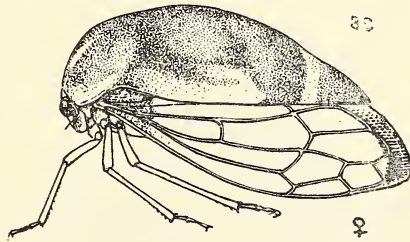
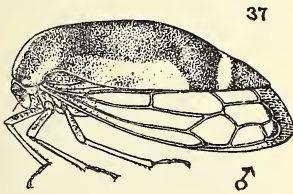
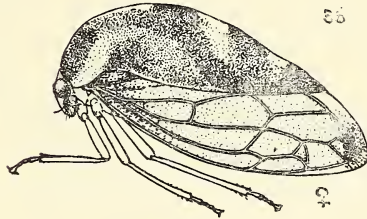
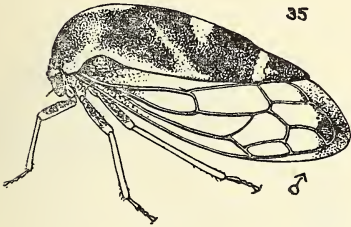
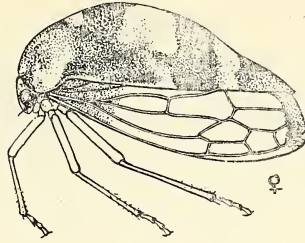
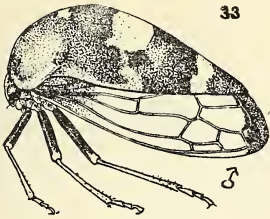
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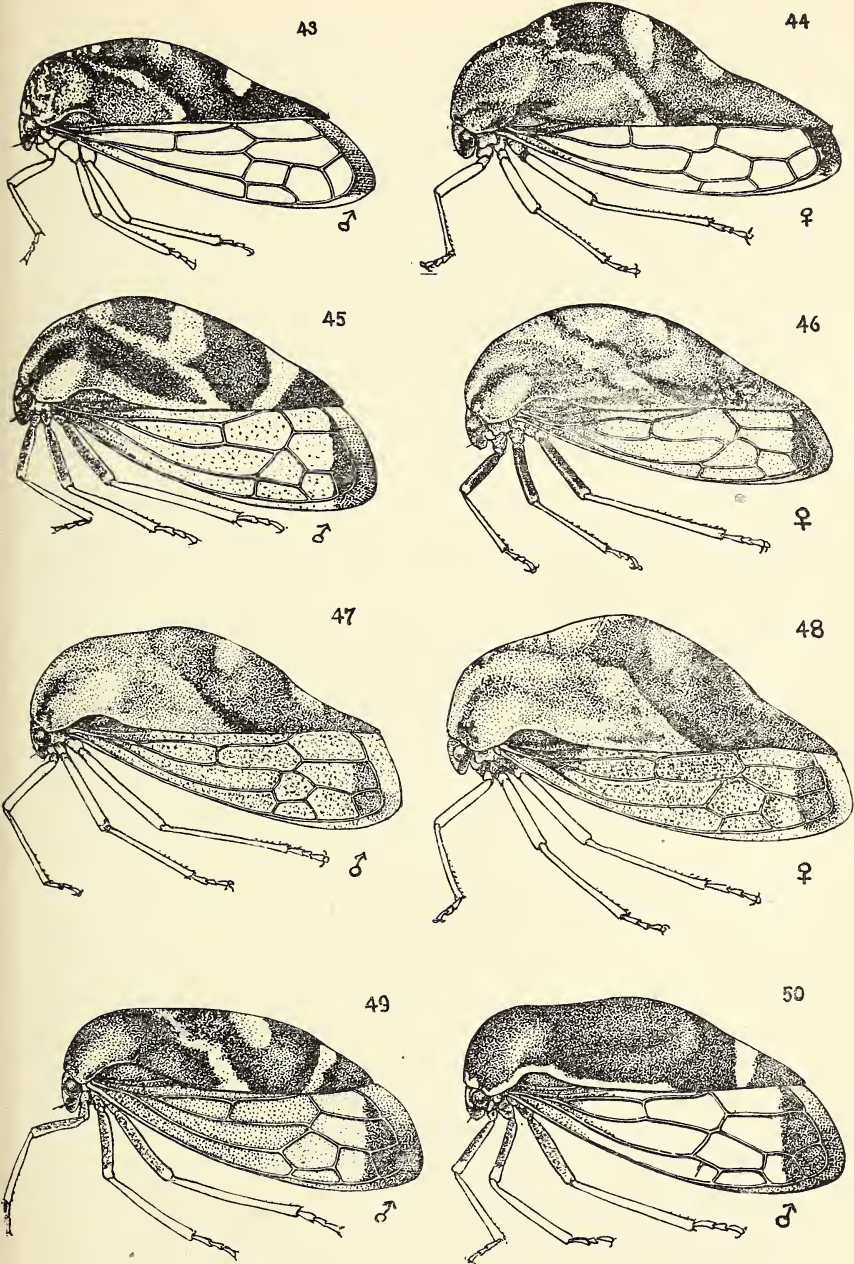
CYRTOLOBUS.



CYRTOLOBUS.



CYRTOLOBUS.



CYRTOLOBUS.

SOME NEW CICADELLIDÆ (HOMOPTERA) FROM THE SOUTHERN UNITED STATES.

BY DWIGHT M. DeLONG,

OHIO STATE UNIVERSITY, COLUMBUS, OHIO.

During the spring of 1921 several interesting species of "Jassids" were collected in the Florida everglades, many of which had not been previously described. This paper is the third one pertaining chiefly to these new forms, the previous articles were published in the Proceedings of the Biological Society of Washington during the past year (Sanders and DeLong).

Idiocerus taxodium new species.

Resembling *nervatus* in general appearance and coloration but smaller and more robust, dark green with a bright iridescent tinge. Length, 3.5 to 4 mm.

Male antennal discs black, elongated, constricted basally and apically, and bearing a flagellum at apex which is almost twice as long as disc.

Color: Vertex, pronotum and scutellum dark green, basal angles of latter usually with a yellowish spot. Eyes bright red even in preserved material. Elytra subhyaline, with a bright bronze iridescent tinge, often smoky at tip, green of abdomen showing through. Sutural veins green. Face washed with yellow, venter green.

Genitalia: Female last ventral segment slightly roundly produced. Male valve with a roundly produced tooth at middle.

Described from a series of twenty-seven specimens collected at Paradise Key, Florida, April 5 and 10, 1921, by Mr. J. N. Knull and the author. All of these were swept from bald cypress, *Toxodium disticum*, trees and shrubs in the small hammocks of the everglades.

Deltocephalus eburneus new species.

In general appearance and coloration resembling a *Scaphoideus* of the *sanctus* group but apparently most closely related to *D. simplex* and *osborni*. Length 4.5 mm.

Vertex very bluntly angled, almost one-fourth wider between eyes than length at middle, disc flat, rather sharply angled with front. Pronotum almost twice as broad as long, side margins very short. Scutellum large.

Elytra long. Clavus reticulate, central anteapical cell long, constricted and divided at center, enlarged posteriorly. Antennæ long.

COLOR: Face, clypeus and loræ heavily embrowned, with traces of pale arcs. Antennal pits black. Vertex white with four small spots above margin and a blotch on disc either side of middle pale orange. Pronotum with a median broad stripe and a narrowed one either side, brownish. Scutellum pale yellow, basal angles and apex darker. Elytra milky white, a large spot on middle of outer clavus dark brown, posterior claval cells washed with yellow. Inner anteapical cell, anterior and posterior portions of middle anteapical cell and outer apical cell pale to dark brown, this pattern forming a cross on the two elytra as in *Scaphoideus cruciatus*. Venter dark with yellow mottling, ovipositor black.

GENITALIA: Female last ventral segment almost three times as long as preceding. Posterior margin slightly narrower at base than preceding segment, lateral margins slightly rounding to prominent lateral angles, posterior margin shallowly concave.

Described from a single female specimen in excellent condition, collected at Corinth, Mississippi, July 8, 1921, and kindly sent to me by Dr. Carl J. Drake, the collector.

***Lonatura bicolor melleus* new variety.**

Size and form of *bicolor* but with different coloration. Anterior margin of vertex black, a round spot at apex and ocelli yellowish. Disc yellow with five finger-like points projecting into the black area. One extending forward almost to apical spot, one either side in front of ocelli, and a second either side about midway along the eye. Pronotum, scutellum, elytra and abdomen yellow. Posterior margins of segments reddish, last dorsal segment black. Face beneath dark brown, paler below. Venter yellow to pale brown with darker markings.

This form occurs on the prairie grasses in company with typical *bicolor*. The color is almost entirely yellow instead of black as in that form.

***Thamnotettix perspicillata rubralineus* new variety.**

Although this form is apparently only a variety of *perspicillata*, and the genital characters are practically the same, it is, nevertheless, slightly smaller in size and is more conspicuously colored. Length 3.4 mm.

It differs from *perspicillata* by having two rather broad bright red longitudinal bands which arise on the face just beneath the vertex and extend across vertex, pronotum and basal angles of scutellum. Also a short longitudinal band extends across the outer angles of the scutellum on either side. If the elytra and wings are removed these longitudinal stripes

are found to extend to the tip of the abdomen. This reddish color frequently shows through giving the elytra a red tinge. Three white circular spots are conspicuous on the clavus of each elytron along the commissural line.

Genitalia as in *perspicillata*.

The nymph was collected in abundance in the last three instars during April both at Miami, Florida, and La Belle, Florida. The nymphs are yellow in color with bright red eyes and a red band extends across the margin of vertex between them. It is slightly interrupted at the middle and terminates in a large black spot either side of apex. A pair of red longitudinal stripes fuse in this black spot either side and extend to the tip of abdomen. Also a pair extending across eyes or arising just behind them extends across pronotum and wing pads, when present, and along lateral margin of the abdomen either side, merging with the central pair at the tip of the abdomen.

The strikingly colored nymphs would seem to indicate a distinct species, but because of the similarity of the adults it is cited as a variety only.

Described from nine adults and a large number of nymphs. Collected at Miami, La Belle, Cleveland, and Orlando, Florida, during April, 1921, by the author.

***Thamnotettix planus* new species.**

Resembling *T. fitchii* in form and coloration but with genital characters very similar to *aureovittatus*. Length 3-3.5 mm.

Vertex blunt anteriorly, a little wider between eyes than length at middle. Pronotum twice as wide as long, strongly convex anteriorly. Elytra rather long, much longer than abdomen.

Color: Somewhat variable, straw to buff, face unmarked, ocelli pale red. Vertex with four small black spots about equidistant from each other in a row just above margin between ocelli. Pronotum in some specimens with a faint suggestion of longitudinal stripes. Elytra with venation pale and conspicuous. Beneath buff.

Genitalia: Female last ventral segment one-half longer than preceding. Lateral margins short, gradually produced to form a conspicuous rounded lobe either side of broad sunken truncated or slightly produced portion which is heavily embrowned and occupies the median third of the segment. Portions of underlying membrane rather large, conspicuous and produced beyond the posterior margin at either side. Male valve slightly produced, scarcely angled almost contained within the concavity of the last ventral segment. Plates short and broad, two-thirds as long as combined width at base. Convexly rounded from base to rather blunt tips. Pygofers much longer than plates, oedagus exceeding plates, bifurcate at apex.

Described from a series of specimens collected by the author at Miami, Florida, April 1 to 14, 1921, La Belle, Florida, April 20, 1921, and Sanibel Id., Florida, April 28, 1921, swept from grasses in dry upland areas. It does not occur in the sawgrass habitat and can easily be distinguished from *aureovittatus* by the different coloration, more flattened vertex, less tumid face and the more sharply angled front and vertex. Also the oedagus of the male genitalia is different.

***Chlorotettix floridanus* new species.**

Resembling *galbanatus* in size and general appearance with vertex more rounded and genitalia different. Length 6 mm.

Vertex bluntly rounded, a little longer at middle than next the eyes and more than twice wider between eyes than length at middle. Pronotum more than twice as long as vertex. Elytra long, greatly exceeding abdomen.

Color bright green with a brownish iridescent tinge especially on elytra. Often washed with yellow.

Genitalia: Female last ventral segment twice as long as preceding, lateral margins roundly produced from half their length to form a broad rounding lobe either side of a broad median somewhat U-shaped notch extending two-thirds the distance to base. The sides of the notch convexly rounded almost to apex where an abrupt broad V-shaped notch is formed. Notch at base broadly embrowned. Male valve almost twice as long as preceding segment, more than twice wider than long, almost rounded at apex. Plates exceeding valve by more than twice its length, gradually sloping almost to apex where they are convexly rounded to form rather blunt appressed apices. Plates are longer and narrower than in *galbanatus*.

Described from four female specimens and one male all from Florida. Collected by the author. One female from Ft. Myers was collected April 22, 1921, and the other specimens were secured at Paradise Key, April 4 and 9, 1921.

***Neocœlidia tumidifrons vittapennis* new variety.**

Agreeing with typical *tumidifrons* in size and form but with elytra distinctly and conspicuously marked.

Pale to bright green, vertex and pronotum unmarked. Scutellum with the two round black spots in the basal angles. Elytra marked with brown vittæ which follow for the most part the wing venation. A stripe just inside the costal margin, a rather broad stripe along the commissural line and the veins of the wings brown, often broadly margined with brown. Sometimes the tips of the elytra are dark brown, smoky.

Described from a large series of specimens from Paradise Key, Ft. Myers, Orlando, La Belle and Miami, Florida. Collected during April, 1921. They live on short grasses in open pineland.

***Cicadula scriptus* new species.**

A very minute species resembling *sexnotata* in coloration but much smaller and with distinct markings. Length 2-2.5 mm.

Vertex arcuately produced, rather broadly rounded, about one and one-half times as wide between eyes as length at middle. Pronotum less than twice as long as vertex and twice wider than long. Elytra when folded causing insect to appear wedge shaped.

Color: Yellow washed with green, margin of vertex along eyes black, a band across vertex just above ocelli seldom broken, and a much broader one just below ocelli, sometimes interrupted at middle, black. A round black spot about the middle either side at base. Pronotum with a pair of approximate black spots near anterior margin and vermiculate markings anteriorly. A pair of approximate round spots at base of scutellum, basal angles and median impressed line black. Elytra smoky green, nervures pale. Sutures between face, clypeus and loræ, a longitudinal stripe across face and clypeus, broken arcs on face and outer margins of loræ dark brown. Beneath yellow, ovipositor black.

Genitalia: Female last ventral segment about as long as preceding, lateral angles slightly produced, posterior margin broadly, shallowly excavated. Ovipositor black. Male valve triangular, apex rounded. Plates exceeding valve by its length, broad at base, gradually tapered to narrowed upturned tips.

Described from a large series collected at Cleveland, Florida, April 25, 1921, by the author. Great numbers of both nymphs and adults were taken from *Eleocharis ochreatea* (Steud) which was growing in a low marshy area where a lagoon had formerly been.

***Dikraneura unipuncta dorsalis*, new variety.**

Agreeing with *unipuncta* in size and form but with different coloration

Disc of vertex and pronotum, scutellum and clavus of elytra covered with a broad longitudinal brownish band which is bordered by a white band extending along margins of vertex from apex, across margins of pronotum on to elytra at base and along claval suture half way to apex. Remainder of clavus brownish. Apical cross veins pale, fuscous margined, and black spot on apex as in *unipuncta*. Face yellowish.

This is a very common variety found in the everglades in company with *unipuncta* and is extremely abundant upon *Trima floridana* in everglade hammocks which are composed partially or entirely of this plant.

Dikraneura marginatus new species.

In form and general appearance resembling *D. kunzei* but darker in color and with distinct genitalia. Length 2-2.5 mm.

Vertex produced, apex rounded, slightly wider between eyes than length at middle. Pronotum one-third longer than vertex, not twice as wide as long. Elytra with outer cell lanceolate. Venation differing from *kunzei*.

Color: Vertex dull yellow tinged with brown, median impressed line and a line just above margin and parallel with it, brownish. Margin below this line pale yellow with a narrow brownish line slightly below middle not extending to eyes. Face below brown, without traces of arcs. Pronotum with anterior third dull yellowish, disc and posterior portion sordid green. Scutellum dark green, apical third paler. Elytra sordid green tinged with yellow. Apical portion paler, venation yellowish. Tergum black, venter dark brown marked with yellow.

Genitalia: Female last ventral segment longer than preceding, posterior margin gradually produced and somewhat convexly rounded. Male valve short, broadly rounded, almost contained within the concavity of last ventral segment. Plates three times as long as width at base, gradually narrowed from base and produced into long attenuated apices.

Described from one female and two male specimens collected at Miami, Florida, April 2 and 3, 1921.

Empoa minutus new species.

A very minute species resembling a *Dikraneura* in general appearance, but with typical *Empoa* wing venation. Length 2 mm.

Vertex rounded, strongly produced, about one-fourth wider between eyes than length at middle. Pronotum one-fourth longer than vertex, not twice as wide as long. Elytra twice as long as abdomen in male. Outer veins of elytra united, then branching to form a triangular cell.

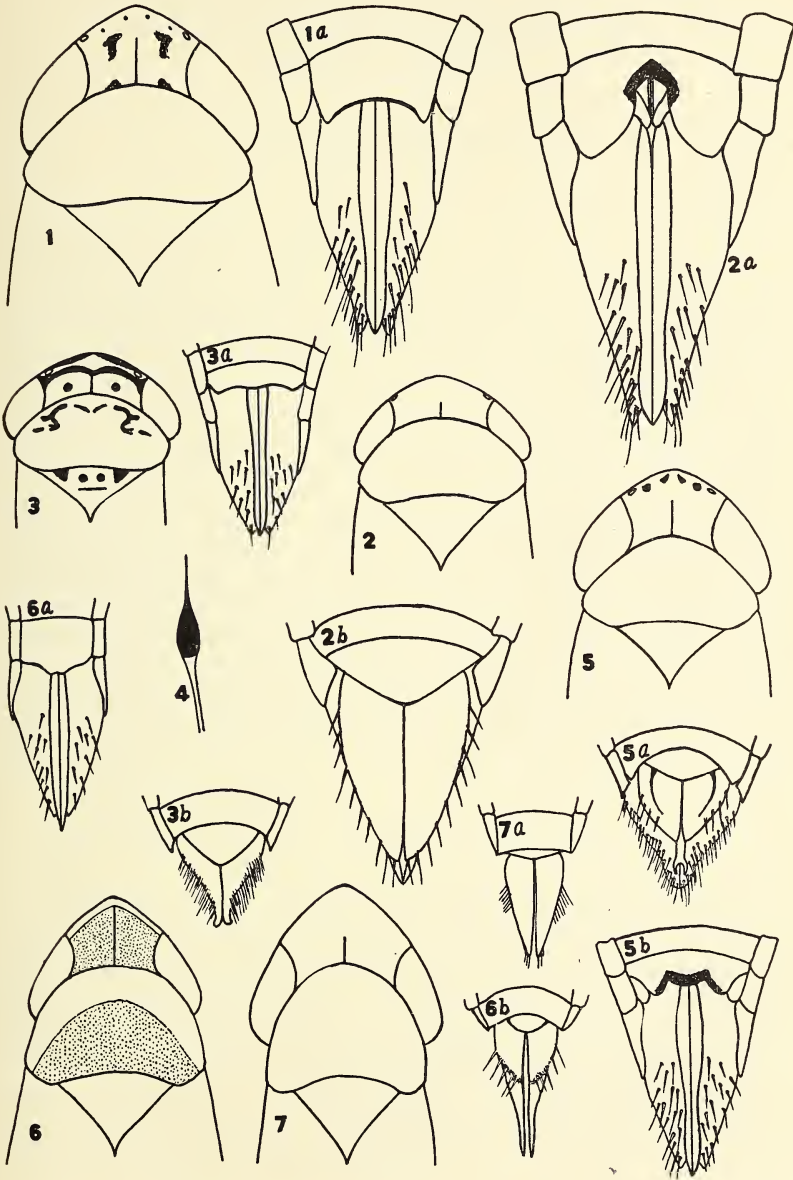
Color white to yellow, with a pair of longitudinal yellowish bands extending across vertex next eyes and across pronotum to scutellum. Basal half of elytra yellowish, claval vein and commissural suture white. Posterior half smoky, veins yellowish.

Genitalia: Male valve rather short and truncate or nearly so. Plates long, rather broad at base, gradually narrowed to rather blunt pointed apices.

Described from a single male specimen collected at Miami, Florida, April 13, 1921, by the author.

EXPLANATION OF PLATE VII.

1. *Doltocephalus eburneus* n. sp.; 1a—female genitalia.
2. *Chlorotettix floridanus* n. sp.; 2a female genitalia; 2b—male genitalia.
3. *Cicadula scriptus* n. sp.; 3a—female genitalia; 3b—male genitalia.
4. *Idiocerus taxodium* n. sp. (antennal disc).
5. *Thamnotettix planus* n. sp.; 5a—male genitalia; 5b—female genitalia.
6. *Dikraneura marginatus* n. sp.; 6a—female genitalia; 6b—male genitalia.
7. *Empoa minutus* n. sp.; 7a—male genitalia.



CICADELLIDAE.

A NEW XANTHOLINID SWARMING ON GRAVE-
STONES ON STATEN ISLAND AND A NEW
TROGOPHLÆUS (COLEOPTERA:
STAPHYLINIDÆ).

BY HOWARD NOTMAN,

BROOKLYN, N. Y.

Trogophlæus weissi new species.

Form moderately slender and rather depressed, much broader posteriorly, the fifth abdominal segment being the widest part of the body. Color black, legs, mouth parts and antennæ piceous black; first antennal joint paler, rufopiceous. Integuments moderately shining. Punctures on head, thorax and elytra rather coarse, those on the elytra much coarser and somewhat sparser, separated by about their own diameters. Abdomen very finely and sparsely punctured, rather strongly microreticulate. Head slightly transverse, about a fifth wider than long, very slightly wider than the thorax, the eyes small and rather feebly convex, the tempora distinctly longer and more prominent, strongly rounded; antennæ short, about as long as the head and thorax, very feebly incrassate but rather thick, the ninth and tenth joints about one-fourth wider than long. Thorax rather more than five-sixths as wide as the elytra and one-half wider than long, base and apex nearly equal with the sides rather feebly arcuate, the disk strongly bi-impressed, the impressions not transversely interrupted. Elytra one-half wider than long and one-third longer than the thorax, the sides rather strongly divergent posteriorly, the disk strongly impressed along the suture. One specimen.

Length 2 mm., width 5 mm.

Type, Middlesex Co., N. J. VIII-23. (H. B. Weiss).

This species is very distinct by its large tempora, strongly bi-impressed thorax with the base and apex nearly equal, strongly transverse elytra with strongly divergent sides and the large abdomen. It may be placed near *T. agonus* Csy, but it seems to be related to *T. egregius* Csy also, though the punctuation is perhaps rather finer and denser. It certainly differs widely in this respect from a specimen of *T. phlæoporinus* in the author's collection. The author takes pleasure in naming it in honor of Mr. Harry B. Weiss, from whom it was received.

Gyrophypnus (*Hypnogyra*) **davisi** new species.

Form slender, parallel. Color bright rufo-testaceous, head and elytra deep black. Integuments shining; head beneath finely strigillate; tempora convex and impunctate. Head as wide and as long as the thorax, a third longer than wide, sides subparallel, neck slightly more than one-half the width; punctures moderately coarse and sparse. Thorax with the sides parallel or slightly convergent posteriorly; the discal series of punctures composed of four; the posterior distant one-third the length from the base. Elytra very distinctly wider and longer than the thorax, disk with coarse, sparse punctures arranged in three more or less distinct series. Abdomen very finely and sparsely punctured, finely micro-reticulate. Thirteen specimens.

Length 4.25-5 mm, width .75-.9 mm.

Type and paratypes, Richmond, S. I., N. Y., Aug. 31, 1923 (Wm. T. Davis), and Lakehurst, N. J., 7, 30, 1922 (F. M. Schott). Collection H. Notman.

Paratype, Richmond, S. I., N. Y., Aug. 31, 1923 (Wm. T. Davis). Collection of the American Museum of Natural History, New York, N. Y.

Paratypes, Richmond, S. I., N. Y., Aug. 31, 1923 and Sept. 28, 1923 (Wm. T. Davis). Collection Wm. T. Davis.

This species is very distinct by its coloration and rather large elytra.

Mr. Wm. T. Davis, in whose honor the author takes pleasure in naming it, gives the following interesting account of the circumstances of its capture:

"This small beetle was observed in considerable numbers on the tops of several gravestones at St. Andrew's Church, Richmond, Staten Island, N. Y., on August 31, 1923. They were running about, often in circles, in a most excited manner, quite unusual among beetles, and reminding one more of the actions of ants. On September 28, a warm day, the beetles again appeared on the tops of several gravestones, but they were not as numerous as on the first occasion."

MISCELLANEOUS NOTES.

On the Generic Position of *Asilus cacopilogus* Hine (*Asilidae*)¹: During the study of the *Asilinae* in the Canadian National Collection it seemed desirable that some character other than wing venation be found in order that at least one or more genera might be more readily separated from the remainder. With this object in view a careful examination of the thoracic sclerites was made and I was able to segregate all species of *Asilus* at once by an examination of the metanotum. This sclerite exhibits rather marked diversity in length and shape in several groups. In all the genera of *Asilinae* which resemble *Asilus* in shape the metanotum is entirely bare or with only very short pubescence, but in *Asilus* it is hairy posteriorly except in the middle. The amount of hair varies somewhat but it is always quite conspicuous and readily seen from the side, where it is usually most abundant.

When I first made use of the character I must not have examined *Asilus cacopilogus* Hine, as I did not find an exception to the rule until making some determinations recently. This species is certainly not an *Asilus*, but must be placed in the genus *Erax*. It comes into the group *E. æstuans* L. This disposition is a quite natural one from the point of wing venation as the posterior branch of the third vein, which is curved backwards at its apex, would run into the tip of the wing but for the curve. There is also, in many specimens, an indication of a stump of vein or evident angulation at the bend in the anterior branch of the third vein.

I have not seen typical specimens of *Asilus leucopogon* Williston, so am unable to pronounce upon the generic position of that species.—C. HOWARD CURRAN.

Parasitic Hymenoptera from New Jersey: Three of the following species do not appear to be listed in Smith's "Insects of New Jersey", and for this reason it was thought desirable to place them on record. The first three species were identified by Mr. A. B. Gahan.

¹ Contribution from the Division of Systematic Entomology, Entomological Branch, Dept of Agric., Ottawa.

Apanteles pyraustæ Vier. Bred from the larvæ of *Pyrausta futilalis* on dogbane, New Brunswick, N. J., August 10.

Sympiesis pennsylvanicus Gir. Bred from the larvæ of *Cop-todisca kalmiella* Dietz, Browns Mills, N. J., June 22.

Meteorus indigator Riley. Bred from the larvæ of *Pyrausta futilalis* on dogbane, New Brunswick, N. J., August 10.

In a letter dated April 15, 1918, Dr. E. P. Felt informed me that he had reared a specimen of *Metopius pollinctorius* Say from a luna moth cocoon found on nursery stock which had been shipped to Rochester, N. Y., from Elizabeth, N. J.—HARRY B. WEISS.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF APRIL 19.

A regular meeting of the New York Entomological Society was held at 8 P. M., on April 17th, 1923, at the American Museum of Natural History; President Harry B. Weiss in the chair, with fourteen members and one visitor, Mr. C. W. Woodworth, Director Bureau of Entomology, Nanking, China, present.

Mr. Erdman West, New Jersey Department of Agriculture, Trenton, N. J., was elected a member. Dr. Henry Fox and Mr. J. J. Davis were proposed for membership by Mr. Weiss.

Mr. Davis spoke of the lecture given in Philadelphia by Dr. Bequaert, of the loss by Dr. Southwick of his slides, and exhibited a new map of the United States, from the National Geographic Magazine, pointing out how plainly certain faunal divisions were shown.

Mr. Mutchler exhibited two boxes of *Saperda* and *Oberea* and discussed the taxonomy, pointing out especially how *Oberea discoidea* Horn 1878 had been overlooked in all the catalogues including Leng's.

Mr. Weiss discussed the life history of the species found in New Jersey, referring to the work of Felt and Joutel on *Saperda*, and of Brooks, as the best since their time.

Mr. Bischoff added *Saperda moesta* to the list—which will later be printed.

Mr. Notman exhibited "Beetles from the Mohawk Valley." He said that he had collected near Fort Hunter from May 31st to June 6th, 1921, on broad gravel beaches and in pools in which water beetles abounded and had obtained some species of interest as indicating limits of distribution. *Bembidion planum*, *versutum* and *canadense*, *Clivina*, *Deronectes catascopium* and *Paria canella* were among the species referred to.

Dr. Leonard said he had been appointed acting State Entomologist while Dr. Felt gave his entire attention to the Gypsy Moth Barrier Zone and contemplated completing the New York State List of Insects, which matter was then discussed by many members.

Mr. Woodworth gave an interesting account of his efforts to train the Chinese at Nanking in economic entomology, particularly in exterminating flies and mosquitoes and thus reducing the deaths from typhoid, cholera and malaria. Twenty-seven men were used in continuous inspection of possible breeding places, dipping the mosquito larvæ out of the pools and destroying the fly larvæ by sprinkling with cyanide solution. The control attained was successful in greatly reducing death and disease. The control of locusts and of silk worm diseases was also in progress.

Mr. J. W. Angell spoke of spiders attacking flies at Ipswich, Mass.

MEETING OF MAY 1.

A regular meeting of the New York Entomological Society was held at the American Museum of Natural History at 8 P. M. on May 1, 1923. President Harry B. Weiss in the chair with 15 members present.

The following were elected active members:

Dr. Henry Fox, Mercer University, Macon, Georgia.

Mr. J. J. Davis, Indiana Agricultural Experiment Station, Lafayette, Indiana.

Mr. Hallinan spoke on "Insects as Food of certain Panama Birds" giving the result of his examination of the stomachs of 440 birds of 159 species. Of these 60 seemed to have fed on insects only and 21 more partly on insects, but among these there was only one moth and Mr. Hallinan said he never saw a bird chasing a butterfly. There were numerous instances in which the habits of the birds in Panama differed from those they had northward.

His remarks were discussed by Messrs. Davis, Lutz, Angell and Shoemaker, the latter asking about catching *Morphos* which Mr. Hallinan said was done by putting sugar cane on the trail with a big net to intercept the butterflies.

Mr. Bischoff exhibited his collection of "Beetles of the tribe *Cryptocephalini*," including four species, recently described by H. C. Fall, new to the New Jersey list.

Mr. Dickerson exhibited some insects found in unexpected places including a bed bug from a can of salmon, a roach parasite (*Evania* sp.) found on a window in Newark August 14, a Ptinid beetle (*Mezium americanum* from a bowl of sugar, and a *Vespa crabro* from a summer porch.

Several members contributed roach stories, ending with a recommendation that molasses in warm countries be poured through a fine screen to remove their legs

Mr. Davis spoke of the coming of brood XIV of 17-year locusts to Long Island in 1923. He said that six of the known broods occurred on Long Island but only two on Staten Island. The Long Island dates had been:

Brood	I	last in	1910
"	II	" "	1911
"	V	" "	1914
"	IX	" "	1918
"	X	" "	1919

" XIV " " 1916 which would bring it due again this year. He also pointed out that while their season was June and any other month had been ridiculed yet an occurrence in October had been twice confirmed.

Mr. Mutchler spoke of a megaphone for insect sounds illustrated in Popular Mechanics.

Mr. Bischoff spoke of the curious inability of non-entomologists to see 17-year cicadas.

Mr. Sherman gave some interesting data as to auction value of Entomologists' autograph letters, e.g., Hagen, 75c, Leconte 75c, Scudder \$1.50, etc.

Mr. Davis recorded April 20 at Rossville, Staten Island, as the first date in 1923 for the little blue butterfly, the season being late.

Mr. Bell confirmed this from his experience at Flushing, New Jersey, April 29, when few butterflies were seen.

The New York Entomological Society

Organized June 29, 1892.—Incorporated June 7, 1893.

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Avenue.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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WILLIAM T. DAVIS.

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NOTES ON THE LIFE HISTORY OF PRIONOCYPHON LIMBATUS LEC. (HELODIDÆ, COLEOPTERA)

BY HENRY G. GOOD,

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Early in the spring of 1922, while on a field trip to Ringwood Hollow, about eight miles from Ithaca, N. Y., many larvæ of a beetle were found in a pool close to the shore as well as on the bank. The adults of the beetle were unknown but were thought to belong to the family *Dasyllidæ*. The writer became interested in the larvæ and attempted to rear them in the laboratory. The larvæ were placed into a rectangular aquarium to which dirt and leaves from the pool were added at one end. The aquarium was then partially filled with water so that about half of the dirt was left exposed, above the surface of the water.

In their natural habitat, the larvæ live in still water, very near the shore, and then only where leaves are found on the surface. The larvæ are most abundant where the leaves are old and partially decomposed, for they feed on the broken-down epidermal cells of such leaves. This conclusion was reached after an examination of the skeletonized leaves and an examination of the stomach-contents of the larvæ. The larvæ also prefer the shadier places and are never found where the direct rays of the sun reach them. When a handful of the leaves is taken and the leaves separated, the exposed larvæ immediately seek shelter, traveling very quickly.

In order to know the habits of the larvæ better, several of them were placed in a glass jar and observations were made of

their activities in the water and on the leaves. They normally seek the underside of the leaves as much as possible and travel over them in a gliding manner. When jarred from the leaves or from any other object upon which they may be, they immediately rise to the surface of the water and crawl in an inverted position by means of their legs and elongate antennæ which serve as flagella. The last abdominal segment protrudes through the surface film and in this way they are able to breathe air directly by means of two spiracles situated on the last segment. There are also five fleshy protractile protuberances whose function the writer has not been able to determine. When hanging on the surface film, it is very difficult for the larvæ to descend to the bottom again unless there are leaves or other objects on which they can gain a foothold. This is due to the fact that they are supplied with very large tracheal tubes which, when filled with air, keep them afloat.

In the latter part of April and in the month of May many of the larvæ were found to be covered with an epiphytic, colonial protozoon, *Epistylus flavescens* Ehr. This thickly-clustered, tree-like organism gives the larvæ a whitish appearance, occurring on the dorsum of the larvæ and more usually towards the anterior end.

The rearing of the larvæ in the laboratory required very little attention except to provide them with sufficient water. On the fourteenth of May, many larvæ were found actively crawling around on the surface of the dry soil and excavating cells in the soil in which to pupate. On the fifteenth of May, one pupa was found. The pupal cell is spherical and a little larger than the pupa. The white pupæ may be easily recognized by the presence of four white, long, slender appendages on the prothorax. These very likely serve as spacers to keep the body from being covered with a body-film of water from the surrounding wet soil. They may also act as levers which enable the active pupæ to turn over, as they often do, especially when disturbed. On the twenty-third of May the first adult was found and from then on they were seen more often. An attempt was then made to find the pupæ in their natural environment. A considerable amount of soil was searched on the bank where the soil was drier, but no pupæ were to be found. A large log, partly submerged and covered with moss,

was then examined. This yielded satisfactory results. Five pupæ were found under the bark in cells which were made of chewed-up wood pulp. The cells were approximately three millimeters high and placed between the bark and the wood. Many larvæ were also found actively crawling through the soft, water-soaked wood. Unfortunately, there were no cells in the process of formation, so that the methods of construction could not be observed.

On the twenty-third of June, the last trip was taken to Ringwood Hollow to collect the adults. They were very scarce and only five were taken. The adults were found among leaves along the bank and in the shadier places, characteristic localities of the larvæ also. The adults are very active and, when disturbed, they attempt to hide under other leaves or they may take to flight. No adults could be found by beating the surrounding vegetation.

As to the complete life-history, there was insufficient time available to get the eggs. From the general habit of the larvæ and the adults, it is very likely that the adults lay their eggs under the leaves along the shore of the pools, in the late spring and early summer. They hibernate in the larval stage either in the second or third instar, depending upon whether there are four or five larval moults. There are two moults in the spring before pupation. Under natural conditions, the pupal stage lasts from ten to fourteen days, depending upon the temperature, while in the laboratory, the period was from seven to ten days.

DESCRIPTION OF THE STAGES OF PRIONOCYPHON LIMBATUS LEC.

Larva. Body subovate, widest at middle, broadly rounded in front and behind; lateral margins setose, 9-10 setæ on each abdominal segment, 8 on thoracic segments divided into 2 groups; color, dusky chestnut brown; length, 9-10 mm. Head-quadrangle, transverse, inserted into thorax to the eyes, rounded on sides, punctate; eyes large and conspicuous; long seta dorsad of eye; epicranial suture extending from eye to vertex, irregularly sinuate; antennæ inserted before eyes, very long, 100-150 segments; labrum quadrate, recurved on sides, strongly setose along cephalic border; epipharynx attached to the ventral surface, very compli-

cated (Fig. 6); mandibles strongly curved with their tips meeting, one long subapical seta, anterior margin with ten setæ, inner surface strongly grooved, densely hairy and punctate; maxillæ elongate, cardo subtriangular with basal angles rounded, stipes irregular with small tuft of setæ on outer edge, palpifer subquadrate, lacinia and galea rounded, hairy, palpus five-jointed, second joint setose; labium quadrate, lateral margin with 12 setæ, palpus 2-jointed, inserted on lateral anterior margin; hypopharynx inserted on labrum, very complicated (Fig. 7); antennæ very elongate, filiform, 100-150 segments, basal joint largest and setose, second joint with few apical setæ, following segments small and similar with two sensory pits on each, length 7-9 mm.

Thorax.—Quadrate, wider than head, lateral margin with 8 setæ in two groups on each segment; meso and metathorax two-thirds as long as prothorax, dorsal surface broadly rounded, sparsely and finely punctate. Legs lighter brown than body; coxæ transverse, elongate, separate; trochanter small, divided, sparsely setose; femora and tibiæ subequal, setose in regular rows; tarsi toothed, unisetose.

Abdomen.—Densely and finely setose, sub-ovate, tapering to apex, ninth segment four-lobed, bearing two spiracles and five retractile protuberances.

Tracheal System.—The larvæ are also easily characterized by having a very large tracheal system composed of two large air reservoirs leading from the anal spiracles. These two large sacs meet in the thorax and do not appear to give rise to any tracheæ in the abdominal regions. In the prothorax are found two small sacs which are connected to the main sac and which give rise to the tracheæ leading into the head. From the prothoracic portion of this main sac, there also arise two tracheæ which divide into smaller branches which lead to the prothorax. Behind each of the legs there is an additional small air-sac which supplies the legs. The tracheal system was observed by placing the larvæ, just after they had moulted and were lightly chitinized, into a solution of hæmotoxylin. The larvæ were very active at first but soon became quieter, when their internal structures could be observed. They will live several hours in this stain.

Circulatory System. The heart is also easily seen, extending from the penultimate abdominal segment to the thorax and the dorsal aorta extends to the middle of the prothorax. The ostia

also show very plainly. When the larvæ are motionless in the solution of hæmotoxylin, one can readily see the blood flow from the aorta into the head and from there to other transparent parts of the body. *The Brain* is composed of two fairly small lobes situated posteriorly in the head. The optic and antennal nerves can be traced very well, especially the latter. The subœsophageal and ventral ganglia could not be seen.

Pupa. White, turning brown before emergence. Body rugose and hairy. Head inserted deep into thorax to the eyes; eyes finely granulate; antennæ inserted between and before the eyes, 11-segmented, one-half length of body; labrum prominent, subquadrate, setose; labial palpi 4-jointed. Thorax with 4 long white tubercles, anterior pair the longer; medial discal impression present; mesothorax small, quadrate; methathorax transverse, finely punctate. Abdomen 9-segmented, tapering, finely punctate and hairy, 9th segment bearing two lobes.

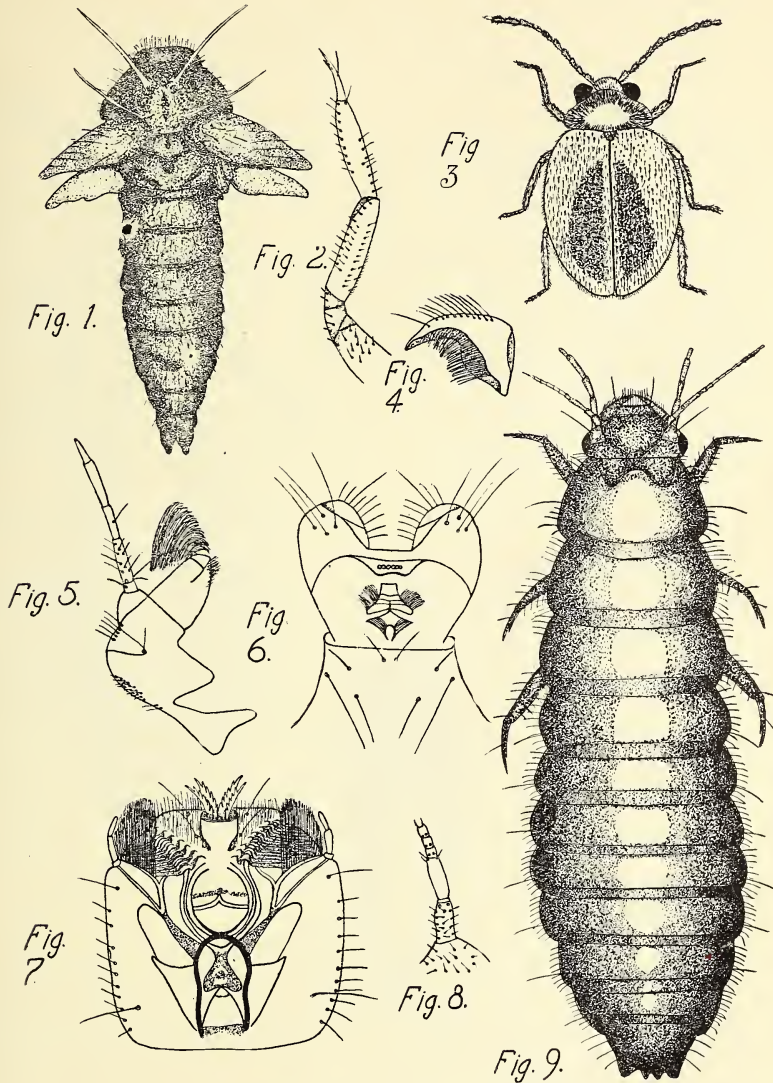
DESCRIPTION OF THE ADULT

Body ovate, moderately convex, yellow-brown, elytra with large median dark spot, variable in size; front between the eyes with rounded dark band. Head retracted into thorax to the eyes, deflected; antennæ eleven-jointed, yellow, segments 4-11 fuscous; first segment subglobose, compressed, larger than the second and third united; labrum projected, transverse, prominent; terminal joint of maxillary palpus enlarged, triangular; labial palpi four-segmented, third arising from the side of the second; mandibles long, prominent. Thorax transverse, slightly narrowed in front, anterior margin sinuate; sides feebly rounded; surface finely and sparsely punctate, finely hairy; scutellum prominent, triangular. Prosternum prolonged between the front coxæ; coxæ separated, small, globose; trochanter distinct; femora wide, flattened; tibiæ slender, curved; metatarsus longer than the next two united; fourth joint deeply lobed, densely pubescent beneath, fifth joint small; middle coxæ contiguous, transverse, prominent; hind coxæ contiguous, large, grooved to receive the femora when in repose. Abdomen 5-segmented, equal in length, yellow, sparingly covered with fine hairs; elytra rather densely and finely punctate,

covered with silken hairs; epipleura wide at humeri extending to the apex. Length, 3.5-4.5 mm.

EXPLANATION OF PLATES VIII AND IX.

Fig. 1, Dorsal view of pupa.....	x17
Fig. 2, Left fore-leg	x65
Fig. 3, Adult, dorsal view.....	x17
Fig. 4, Right mandible	x65
Fig. 5, Left maxilla	x65
Fig. 6, Labrum and epipharynx	x135
Fig. 7, Labium and hypopharynx.....	x135
Fig. 8, Base of antenna	x65
Fig. 9, Larva, dorsal view.....	x25
Fig. 10, Heart and brain.	
Fig. 11, Pupa, ventral view	x17
Fig. 12. Respiratory system showing the trachea.	



PRIONOCYPHON LIMBATUS

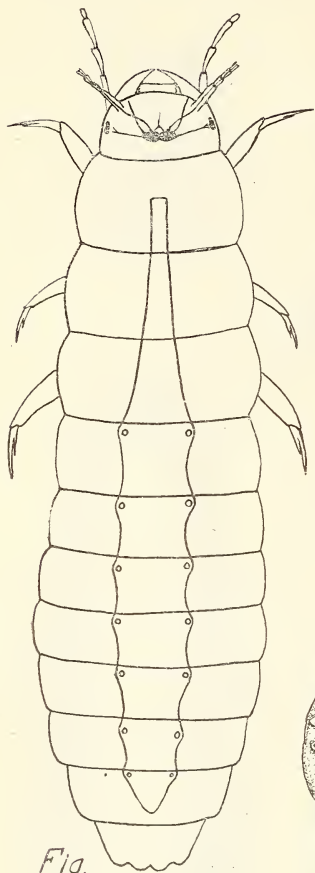


Fig.
10.

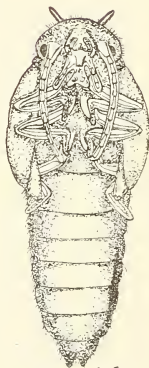


Fig. 11.

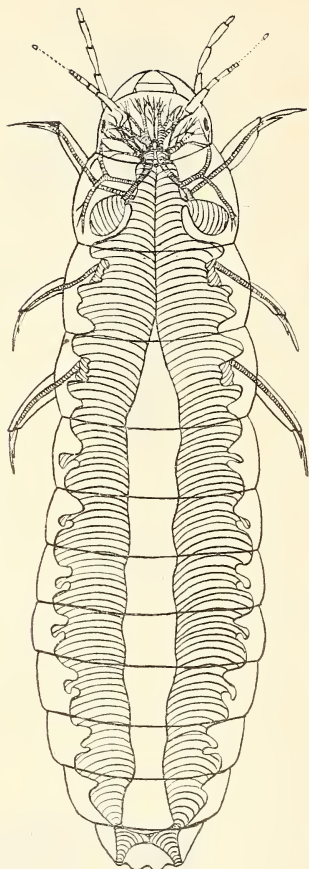


Fig. 12.

PRIONOCYPHON LIMBATUS

NEW SPECIES OF NORTH AMERICAN HYDROBIINI

BY H. C. FALL,

TYNGSBORO, MASSACHUSETTS.

Philhydrus elongatulus, new species.

This name is proposed for a form occurring in Florida which is obviously close to *ochraceus* in all essential characters, and is possibly an extreme form of that species. The very small size and notably narrower body however give it a quite distinct appearance when compared in series with *ochraceus*. I have previously called attention to the fact* that in *ochraceus* and *nebulosus* the very small emargination at the ventral apex is deeper and more obvious than in the other species in which it occurs; it may be significant therefore that in the present species this emargination is so extremely minute as to be detectable only with difficulty under the highest powers of the simple lens. Length 2.2 to 2.65 mm. (type 2.35x1.3 mm.).

The type is a female collected by the writer at Dunedin, Florida, Apr. 6, 1922. Other examples were taken at St. Petersburg and Tarpon Springs.

Philhydrus blatchleyi, new species.

Piceous black, sides of thorax more or less paler, elytral margins sometimes evidently paler, but often feebly or scarcely so. Form moderately elongate oval and only moderately convex, nearly as in *nebulosus*. Head piceous, sides of clypeus paler in both sexes. Punctuation a little closer and stronger than in *nebulosus*, the coarser punctures inconspicuous. Prosternum not carinate; mesosternal lamina with lower edge subhorizontal, anterior edge vertical, the free angle acutely produced. Ventral apex with minute emargination, which as usual is set with a close series of porrect spinules. Protarsal claws of male each with a moderately strong nearly rectangular basal tooth, that of the outer claw not appreciably larger; claws of middle and hind feet with similar but progressively smaller basal teeth, those of the hind feet sinuate within beyond the basal appendix in the male.

Length 3.5 to 4.3 mm.; width 2 to 2.4 mm.

The type is a male taken by the writer at Dunedin, Florida, and bears date IV-3-'23. Other examples were taken at Tarpon Springs and St. Petersburg. It seems to be not uncommon and probably will be found in most collections of Florida material masquerading under some other name—perhaps *terplexus*.

In form and size this species resembles the larger examples of *nebulosus*, and in the case of somewhat immature examples

*Coleoptera of So. California—Occas. Pap. Cal. Acad. Sci. VIII., p. 217.

the similarity is very deceptive. By its sinuate posterior male claws it is to be associated (among eastern species) with *nebulosus*, *ochraceus*, *elongatulus*, *hamiltoni*, *diffusus* and *reflexipennis*. All these are normally of some shade of testaceous, while *blatchleyi* is truly piceous. Furthermore, *nebulosus* may be at once separated by its carinate prosternum, *ochraceus* and *elongatulus* by the feebly developed mesosternal lamina which is not mucronate, and the remaining three species by their more unequally and strongly toothed or lobed male claws, as well as the completely non-emarginate ventral apex. This distinct species is dedicated with a good deal of pleasure to friend Blatchley whose hospitality at his winter home at Dunedin, Florida, I have greatly enjoyed and with whom I have spent many pleasant hours in the field.

I take this opportunity to say that in the Californian *Philhydrus conjunctus* Fall, the hind tarsal claws of the male are really sinuate as in the above-named species, and not simply curved as I imply in the remarks following its description.

Cymbiodyta vindicata, new species.

Not long after the appearance of Horn's paper on the Hydrobiini (Phila., 1890), Mr. Frederick Blanchard (in litt.) called the Dr.'s attention to the fact that the series of *Cymbiodyta fimbriata* Melsh in his own and other collections was separable into two forms, one more rotundate and more convex, the other more elongate or oblong-oval and subdepressed. Blanchard was a very keen observer and a most careful student and rarely went wrong in matters of this sort, and although Horn would not acknowledge that there were two species involved, I am quite convinced that Blanchard was right. Investigation at Cambridge shows that the more broadly oval convex form is the one Melsheimer had in hand, and that Zimmermann's *semistriatus* is identical with this. For the narrower less convex form the above name is suggested. Aside from the difference in form, which is evident enough when the specimens are arranged in series, the true *fimbriatus* is vaguely but unmistakably substriate toward the elytral apex, while in *vindicatus* there is scarcely a trace of this striation. The two species are otherwise extremely similar.

Judging from my own collection *vindicatus* is a widely dispersed species. The type is a Tyngsboro, Mass., example bearing date 8-17-18. Other examples in my series are from Marion and Wakefield, Mass.; Farmington, N. H.; Rhode Island; Staten Island, N. Y.; Duluth, Minn.; Mile 17, H. B. Ry., Manitoba; Sumas, Wash.; Terrace, B. C. The true *fimbriata* on the other hand seems to be much more restricted in range.

My own examples are all from New Hampshire and Massachusetts, and in my experience it is in these States much less frequent than *vindicatus*.

***Cymbiodyta acuminata*, new species.**

Size, form and general aspect almost precisely as in the smaller specimens of *C. vindicata* or *Philhydrus perplexus*; color, lustre and punctuation substantially as in the species mentioned, but with the sides of the thorax as a rule more conspicuously paler, the pale margin also extending narrowly across the apex, and vaguely inward for a little distance along the base. The specific character however separating it from all our other species of the genus, is the elevation of the mesosternal transverse ridge at middle into a long subconical acute spur or mucro. This structure exists in the European *C. marginella*, to which our species is more closely allied than to any of our own fauna.

Specimens in my collection are from Edmonton, Alberta (F. S. Carr); Stonewall, Manitoba (J. B. Wallis), and Ritzville, Wash. (M. C. Lane). The type label is attached to an example from the first named locality and was taken "4-4-19" by Mr. Carr, from whom I first received the species.

In the Fauna Boreali Americana Kirby uses the name *Hydrobius marginellus* Fab. for "two specimens taken in latitude 54°." LeConte expressed the opinion that this was an erroneous identification, and suggested that the insect may have been *Philhydrus fimbriatus* Melsh. In the Leng List, Kirby's *marginellus* is referred to *C. lacustris* Lec. The correctness of this reference is very greatly doubt and would suggest as an alternative of greater likelihood that Kirby had in hand the present species, which inhabits that region and is really the North American analogue of *marginella* Fab.

***Cymbiodyta lacustris* Horn, (not Le Conte).**

While examining some types of our Hydrobiini on a recent visit to the Museum of Comparative Zoology at Cambridge I was not a little surprised to find that the unique Lake Superior type of *Philhydrus lacustris* Lee is really a *Philhydrus*, and not a *Cymbiodyta* as recorded in Horn's paper, and differs in no appreciable way from an ordinary dark colored specimen of *P. ochraceus* Melsh. The *lacustris* of LeConte thus becomes a synonym, and the *C. lacustris* of Horn's monograph, which is a true *Cymbiodyta*, must be written *C. lacustris* Horn.

***Anacaena signaticollis*, new species.**

This name is proposed for the form with variegated thorax which Horn conceived to be the *Brachypeplus infuscatus* of Motschulsky, and

which he describes in his paper on the Hydrobiini (Trans. Am. Ent. Soc., XVII, 1890, p. 275) as the normal condition in specimens "clean and free of discoloration." *H. feminalis* Lec., and *H. castaneus* Lec., are, according to Horn, also the same thing, the latter having been founded on "dark discolored specimens". There can be no doubt I think that *castaneus* Lec. is the same as *infuscatus* Mots, but in a good series of perfectly clean specimens there is never any sign of the thoracic markings which Horn figures (Plate IV, fig. 16). The thorax is invariably uniformly piceous throughout except as it becomes narrowly indefinitely paler at the side margins, agreeing thus with Motschulsky's description. *Feminalis* Lec., is not appreciably different. The form with the thoracic markings is, however quite distinct from the above. Not only is the coloration constantly different—always assuming of course that we have to do with clean specimens—but the form is somewhat more broadly oval and the convexity notably greater; the size also a little smaller. Moreover it is practically certain that the present form does not occur in Alaska (the type locality of *infuscatus*) nor even along the North Pacific Coast of the United States so far as I am aware. My series of *signaticollis* is from Southern California and New Mexico (Jemez Springs). I have attached the type label to a specimen from Pomona, California, bearing date "Mar. 25, '93."

Paracymus longulus, new species.

Narrowly oblong oval, depressed; above piceous, head entirely so; thorax with rather sharply defined pale side margins, apical margin not evidently paler; elytra with side margins indefinitely paler. Surface lustre strongly shining, not visibly alutaceous, punctuation rather strong but not close, coarser and subseriate on the elytra. Body beneath piceous, opaque; legs entirely rufo—or brunneotestaceous.

Length 2.2 to 2.6 mm.; width 1.15 to 1.25 mm.

Described from three examples taken by the writer at Mitchell, Indiana, July 16, 1910.

This species is most nearly in accord with *B. monticola* Horn, agreeing with it in its 8-jointed antennæ, simple mesosternum and general habitus: it is however even narrower and more depressed, the thorax without pale apical margin, the elytra truly piceous, the legs entirely pale, the size somewhat smaller.

Paracymus alticola, new species.

Oblong-oval, subdepressed, blackish piceous above, the elytra becoming indefinitely brownish apically, the side margins however not at all pallescent. Head entirely black. Prothorax with side margins rather

abruptly but very narrowly pale, the pale margin extending narrowly across the apex and somewhat more widely inward for a short distance along the base. Head and thorax finely alutaceous but shining, elytra with rather coarser punctures which are in great part subserially arranged, more especially toward the sides and apex. Femora piceous, tibiae and tarsi testaceous. Antennae 8-jointed, pro- and mesosternum entirely simple.

Length 2.75 to 3.1 mm.; width 1.55 to 1.75 mm.

Two examples, Tioga Pass, 10,000 ft., Sierra Nevada Mts. California 8-24-16; collected and kindly given me by Mr. J. O. Martin.

This species is even more nearly related to *monticola* than the last, differing but little except in its truly piceous elytra, these being always brownish testaceous in *monticola*.

Paracymus seriellus, new species.

Moderately elongate oval; outline, convexity and size very nearly as in *digestus*, from which it may be distinguished by the smooth and polished head and prothorax, without trace of alutaceous sculpture, and by the simple mesosternum. The punctuation is generally a little finer than in *digestus* but is somewhat variable. The elytral punctures are very distinctly serial or subserial in arrangement almost throughout, but most conspicuously so at sides where two of the series are more evidently impressed, simulating striae. In its simple mesosternum it agrees with *rufiventris*, but is much less convex than the latter and with the outer rows of punctures stronger and more evidently impressed.

Length 2.5 to 2.8 mm.; width 1.4 to 1.5 mm.

Described from five examples from California (San Bernardino Mts.; Pomona; Marin Co.). The type, collected by the writer, bears label "S. B. Mts. Cal. 7-16-'92".

This species naturally takes its place between *digestus* and *rufiventris* in Horn's table (Trans. Am. Ent. Soc. 1890, p. 270). It was identified for me originally as *rufiventris*, and probably so stands in other collections.

I am indebted to Mr. Liebeck for comparing a specimen of the present species and one of the true *rufiventris* with Horn's type, thus establishing the identity of the latter.

Rufiventris was described from Oregon. I have a single example from Washington and another from British Columbia but have not yet seen specimens from California.

SOME NEW HALTICINI FROM INDIANA AND
ONTARIO

BY W. S. BLATCHLEY,

INDIANAPOLIS, INDIANA.

Since my paper entitled "Notes on Indiana Halticini, etc." was published in this JOURNAL¹, a number of additional species have been taken in Southern Indiana, four of which are evidently new to science. Among some Coleoptera sent to me for naming by J. F. Brimley, of Wellington, Ontario, was also an undescribed species of *Longitarsus*. The descriptions of these new forms are as follows:

Disonycha admirabila, new species.

Oblong, subparallel, convex. Thorax, under surface and femora dull yellow; antennæ in great part, scutellum and a sutural discal and submarginal stripe on each elytron, black; head and two narrow stripes on each elytron dull red, the red stripes bordered each side by a narrow one of silvery-white which lies adjacent to the black stripe; tibiæ and tarsi wholly fuscous-black; labrum and basal joint of antennæ piceous; last joint of antennæ pale. Head impunctate, the tubercles and frontal carina small, obtuse. Thorax two-thirds wider than long, absolutely smooth, sides rounded into base; front margin truncate, hind one convex. Elytra slightly wider at base than thorax, very finely alutaceous, minutely and very sparsely punctate. Abdomen and femora very finely punctate, minutely pubescent. Length 4.5 mm.

Knox Co., Ind., September 18. Taken by sweeping smartweed (*Polygonum*) in a dry upland woods. Allied to *caroliniana* (Fab.) but differs in its smaller more parallel form, dark labrum, wholly dark tibiæ and the alutaceous tricolored elytra. From *crenicollis* (Say) it differs in its smaller size, much narrower non-alutaceous and impunctate thorax without black spots and much more finely alutaceous elytra.

Longitarsus pallescens, new species.

Broadly oval, convex, robust for the genus. Color above a uniform pale dull yellow; apical half of antennæ brown, labrum shining black; abdomen in great part chestnut-brown. Head impunctate, occiput finely alutaceous; antennæ very slender, joints 2-4 gradually slightly increasing in length. Thorax subquadrate, one-third wider than long, sides rather broadly rounded, front angles thickened, disk rugose, rather coarsely, shal-

¹Vol. XIX, No. 1, March, 1921, pp. 16-27.

lowly irregularly punctate. Elytra oval, one-third wider at base than thorax, humeri rounded, umbones evident but small; disk finely, very shallowly evenly punctate. Under surface and femora very finely punctate, minutely pubescent. Length 2.8 mm.

Prince Edward County, Ontario, April 7. Two specimens collected by J. F. Brimley. Belongs under *c*, p. 18 of my key, *loc. cit.*, and allied to *subrufus* Lec., but differs in its pale color, much broader form, more slender antennæ, alutaceous occiput and rugosely punctate thorax.

***Longitarsus acutipennis*, new species.**

Elongate, convex; widest at middle of abdomen, strongly tapering behind, color a uniform shining pale brownish-yellow. Head impunctate, occiput minutely transversely strigose. Antennæ slender, three-fourths the length of body, joints 2-4 subequal in length. Thorax subelliptical, convex, one-half wider than long, sides rounded; disk minutely alutaceous, very finely and sparsely unevenly punctate. Elytra narrower at base than middle of thorax, thence gradually widened to middle, then tapering to the narrowly rounded or subacute tips; humeri, umbones and inner wings absent; pygidium concealed; disk rather coarsely, closely and evenly punctate. Length 1.8 mm.

Crawford County, Ind., August 5. Swept from goldenrod. Belongs under *pp*, p. 19 of my key, except that the pygidium is concealed. Of the twenty-one eastern species of *Longitarsus* at hand this differs from all in the strongly tapering posterior portion of the body. It is also paler than any of those belonging to the subgenus *Apterius* in which the humeri, umbones and inner wings are wanting.

***Glyptina ferruginea*, new species.**

Broadly oval, robust. Dark reddish-brown, shining, thorax and under surface somewhat paler than elytra; apical half of antennæ fuscous-brown. Head smooth. Antennæ slender, half the length of body, joints 2-4 subequal in length, 2 stouter than 3. Thorax subquadrate, convex, less than one-half wider than long, not narrowed in front, sides feebly curved, front angles slightly obliquely truncate; disk very finely, sparsely aciculate punctate. Elytra at base nearly one-half wider than thorax, conjointly oval, tips broadly rounded, striæ coarsely, somewhat rugosely and closely punctate, the ninth stria not more impressed than those on disk; intervals almost flat, each with a single row of very minute punctures. Length 1.3-1.5 mm.

Crawford Co., Indiana, August 1-4; three specimens taken by sweeping low herbage along a pathway on high wooded slopes. Allied to *brunnea* Horn but distinctly shorter and relatively broader, with antennæ darker and punctures of elytra coarser.

Glyptina leptosoma, new species.

Narrowly oval, strongly convex, tapering behind. Above and beneath reddish-brown, shining; antennæ reddish-brown, the apical third fuscous; legs pale brownish-yellow. Antennæ slender, two-thirds the length of body, second joint not stouter than third, slightly more than two-thirds the length of latter. Head impunctate. Thorax subquadrate, strongly convex, scarcely wider than long, side margins broadly curved, their front ends tuberculate; disk rather coarsely, shallowly, not densely punctate. Elytra conjointly oval, about one-fourth wider at base than thorax, sides broadly curved, strongly tapering behind the middle, to the narrowly rounded tips; disk strongly convex, punctures of striae relatively coarse, those on sides finer; intervals flat, impunctate. Abdomen finely and sparsely punctate, minutely pubescent. Length 1.2 mm.

Crawford County, Ind., August 4; taken by sweeping goldenrod. Smaller, narrower and more strongly convex than either *brunnea* or *feruginea*, the thoracic punctures coarser and the elytra much more narrowed behind the middle. In form it much resembles some of the smaller species of *Longitarsus*.

THE INSECTS AND PLANTS OF A SALT MARSH ON THE COASTAL PLAIN OF NEW JERSEY

BY HARRY B. WEISS and ERDMAN WEST,

NEW BRUNSWICK, N. J.

INTRODUCTION

This paper is the third of a series dealing with plant and insect surveys of various sections of New Jersey. The first dealt with conditions in a moist woods on the Piedmont Plain of New Jersey and the results were published in the *JOURNAL OF THE NEW YORK ENTOMOLOGICAL SOCIETY* (vol. xxx, No. 4, Dec., 1922, pp. 169-190). The second covering an area in the "pines" of New Jersey was submitted to "Ecology". The present paper is concerned with the plants and insects of a salt marsh on the coastal plain of New Jersey. In all three papers an effort was made to show the types of insect food habits present and their relationship to the flora.

ACKNOWLEDGMENTS

The insects collected were identified by the following entomologists, to whom we are greatly indebted: Mr. C. W. Johnson, Diptera; Mr. C. A. Frost, nearly all of the Coleoptera; Mr. Howard Notman, Staphylinidæ; Mr. Henry L. Vierick, Hymenoptera; Mr. William T. Davis, Orthoptera and Odonata; Mr. Harry G. Barber, Hemiptera; Mr. C. E. Olsen, Cicadellidæ and Fulgoridæ; Mr. M. R. Smith, Formicidæ.

THE NEW JERSEY SALT MARSH

About three-fifths of the entire area of New Jersey belong to the coastal plain and the salt marsh areas are found for the most part lying between the bars fringing the coast and the mainland. Marsh land is found also along Delaware Bay and extending for some distance along the rivers stretching inland through the marshes. Mr. C. C. Vermeule (*Geol. Survey, N. J.*, vol. I, 1888, p. 178) has calculated that some 660 square miles of New Jersey including some small water areas consist of tide marsh,

this estimate including the tide marshes of the Hackensack valley. Excluding the Hackensack valley marshes, the tide marsh area of the coastal plain embraces about twelve per cent of its area.

Prof. John B. Smith (N. J. Agr. Exp. Sta. Bul. 207, pp. 6-8), writing about the New Jersey salt marsh and its improvement, states that there are three general types of marsh land. The first is covered at every mean high tide and may or may not support sedge or joint grass. This type is more plentiful south of Great Bay and is the smallest in area. The second type is rarely covered at ordinary tides but is so little above mean high water that slight rises due to wind, storm or moon changes result in a watery covering. This type may be covered by sedge but more usually has a thin growth of joint grass and is generally very flat and level. This type is also more plentiful south of Barnegat Bay. The third type is above mean high tide but likely to be covered by spring and fall tides and by winter or storm tides. Such marsh is more or less completely covered by vegetation and cut by creeks and waterways.

Dr. Witmer Stone (Plants of So. N. J., N. J. St. Mus. Rept., 1910, p. 97) lists some 40 species of plants as making up the true salt marsh vegetation and states that of these, *Spartina patens*, *Distichlis spicata*, *Juncus gerardi*, *Salicornia europæa*, *S. bigelovii* and *S. ambigua* make up the bulk of the vegetation on the open marsh. Prof. Smith (loc. cit.) states that the upper layer of the average salt meadow extending from 12 to 18 inches in a huge sponge composed of a mass of roots and vegetable material capable of holding water and drying out slowly by surface evaporation. A salt marsh sod 10 by 10 by 27 inches weighing 121 pounds was taken by Prof. Smith from the Raritan marsh in 1907 and turned over to Dr. Jacob Lipman, who furnished the following statement concerning it:

Original weight	121	pounds
Dry weight	23.39	pounds
Moisture	80.67	per cent
Dry matter	19.33	per cent
	Upper portion	Lower portion
	per cent	per cent
Nitrogen	0.65	0.63
Organic matter	34.23	21.30
Ash	65.75	78.70

Dr. Lipman also stated that "the spongy, fibrous character of the upper portion of the sod is gradually modified in its lower portion. The distinct root structure tends to disappear and with the darker color the entire mass becomes more compact and resembles muck rather than peat. The proportionate amount of carbon and ash are both increased, while the proportion of organic matter is diminished."

THE SURVEYED AREA

The surveyed area consisted of about five acres of marsh belonging to the third type as outlined by Smith and having a shape somewhat similar to an isosceles triangle. The two long legs of the triangle were bounded by rather wide natural ditches and the base by a narrow, artificial ditch. The short and one long side of the triangle were protected from the waterfront of Raritan Bay by large bluffs but the other long side faced the balance of the Cheesequake meadow which extends inland along the Cheesequake creek. The exact location which lies in about latitude $40^{\circ} 27' N.$ and longitude $74^{\circ} 15' W.$ will be found on the accompanying map. Collecting was done at regular weekly or ten-day intervals throughout the seasons and an effort was made to obtain a fair sample of the species present regardless of the groups to which they belonged. The prevailing winds were toward the bluff and waterfront of Raritan Bay and for this reason it is supposed that not many species from the bluff found their way to the marsh. Most of the species were collected by sweeping the vegetation. Sifting of the soil was out of the question on account of its water-logged condition.

Dr. W. Rudolfs, bio-chemist at the New Jersey Agricultural Experiment Station, very kindly examined a sod taken from the section where the survey was made and supplied the following table, which shows the hydrogen-ion concentration at different depths as indicated by the values under pH. The hydrogen-ion concentration indicates the active acidity of the soil *in toto* and the lower the figure, the greater the acidity, the neutral point being 7.0.

Dr. Rudolfs stated that the changes in reaction in the different layers of soil and the change in color seemed to indicate that the area was occasionally flooded by salt water, and this was true as observed during the survey. Some of the salt stays in the top layer and with progressive depths a part is leached out or possibly taken up by the plants, whereas at the place where the root systems of the plants stop, hydrogen-ion concentration decreases and goes up nearly to the neutral point. Dr. Rudolfs suggests that this might be caused by poor drainage at this depth, especially since the water in the hole registered the same degree of hydrogen-ion concentration. The yellowness of the water indicates that the roots are decaying leaving a colloidal substance in the soil.

THE VEGETATION OF THE SURVEYED AREA

The vegetation of salt marshes in general is characterized by the monotony of its general aspect, for it lacks contrasts or even striking variations in the color or size of its component parts. The vegetation of the surveyed area was no exception to the rule; in fact, the general trend was emphasized in the paucity of the species present and the marked tendency for them to grow in pure stand. Three typical salt marsh plants, *Spartina patens*, *Distichlis spicata* and *Juncus gerardi*, covered a large proportion of the marsh. The first two only showed a slight tendency to intermingle and at least sixty per cent of the area was covered by these two plants. The other forty per cent was composed of the various other species mentioned later with *Spartina glabra* and *Juncus gerardi* as the most prominent. As a whole the marsh was well drained and there was an absence of pools or "rotten spots" as they are frequently called. However, a few plants characteristic of such conditions were found mingled with the grasses mentioned above. *Atriplex patula*, *Salicornia europæa* and *S. mucronata* were three well distributed though inconspicuous species. They were most numerous where the grass mat was least dense. Occasional patches of sea lavender, *Limonium carolinianum* were conspicuous at blooming time with their large mist-like sprays of lavender colored flowers. Their broad leaves were also different from the usual leaf-type of the marsh.

Along the creeks and ditches there was a border of tall, salt grass, *Spartina glabra*. Where the banks were sloping and low, the border was wide, but where the banks were steep, it was narrow, and the dividing line between it and the low grasses of the marsh proper was sharp. Along the banks of the larger streams there was mingled with the tall salt grass the shrubby marsh elder *Iva oraria*, which sometimes extended along the smaller ditches where the tall, salt grass did not invade.

A vista of the entire area after the first of July showed a flat marsh dissected at irregular intervals by hedges of marsh elder or the tall, salt grass or both. In the flat marsh, especially where *Spartina patens* predominated, the low grassed were billowed and sometimes almost prostrate from the effects of the prevailing winds, together with the work of occasional high tides.

THE INSECTS OF THE SURVEYED AREA

The following tables summarize the insect findings by orders and families:

INSECTS COLLECTED ON IVA ORARIA

Order and family	Number of species	Order and family	Number of species
Neuroptera		Coleoptera	
Chrysopidae	1	Coccinellidae	5
Homoptera		Lampyridae	1
Aphididae	1	Cerambycidae	1
Cicadidae	1	Chrysomelidae	3
Membracidae	1	Curculionidae	1
Hemiptera			
Lygaeidae	2		18
Miridae	1		

The marsh elder which fringed one bank of the marsh was inhabited by plant lice and five species of coccinellids. The lampyrid *Chauliognathus marginatus* was also rather plentiful on this plant, as were numerous specimens of the lace-wing *Chrysopa oculata* Say and its long stalked eggs. During the sweeping of these plants in July and August several females of *Tibicen*

chloromera Walker were disturbed. In addition, many of the bushes were infested by nymphs and adults of the membracid *Micrutalis calva* Say and adults persisted from early June until the middle of September. The mirid *Lygus pratensis* L. was present, and several species of *Lygaeidæ*. The curculionid *Boris interstitialis* Say was observed feeding on the stems and during June and July large numbers of the chrysomelids *Paria canella aterrima* Oliv., and *Systema pallicornis* Fab., appeared and fed extensively on the leaves and stems, causing them finally to turn brown and die. In addition, some of the stems which were cut open were found to contain cerambycid larvæ.

INSECTS TAKEN IN FLIGHT OR BY SWEEPING THE MARSH

Order and family	Number of species	Order and family	Number of species
Platyptera		Erotylidæ	1
Sialidæ	1	Histeridæ	1
Odonata		Dasyllidæ	1
Agrionidæ	2	Lampyridæ	1
Libellulidæ	2	Malachidæ	2
Homoptera		Cleridæ	1
Fulgoridæ	9	Bostrychidæ	1
Cicadellidæ	9	Scarabaeidæ	1
Chermidæ	2	Chrysomelidæ	7
Hemiptera		Mordellidæ	1
Pentatomidæ	5	Curculionidæ	7
Lygaeidæ	6	Calandridæ	2
Nabidæ	1	Lepidoptera	
Reduviidæ	1	Pyralidæ	2
Anthocoridæ	1	Microlepidoptera	2
Miridæ	2	Hymenoptera	
Sialidæ	1	Braconidæ	2
Orthoptera		Ichneumonidæ	8
Acridiidæ	3	Eulophidæ	1
Locustidæ	2	Pteromalidæ	2
Coleoptera		Encyrtidæ	1
Cincindelidæ	1	Diapriidæ	1
Carabidæ	5	Ceraphronidæ	1
Staphylinidæ	2	Formicidæ	5
Phalacridæ	2	Tiphidæ	1
Coccinellidæ	1	Eumenidæ	1

Order and family	Number of species	Order and family	Number of species
Ceropalidæ	1	Pipunculidæ	3
Sphecidæ	2	Syrphidæ	4
Crabronidæ	1	Tachinidæ	5
Larridæ	1	Sarcophagidæ	2
Halictidæ	2	Muscidæ	3
Dryinidæ	1	Anthomyidæ	5
Diptera		Scatophagidæ	1
Tipulidæ	3	Borboridæ	2
Chironomidæ	3	Sciomyzidæ	2
Culicidæ	2	Ortalidæ	2
Mycetophilidæ	1	Ephydridæ	7
Stratiomyidæ	2	Oscinidæ	7
Tabanidæ	7	Agromyzidæ	2
Dolichopodidæ	9		

Most of the above species were taken by sweeping the marsh vegetation, the exceptions mainly being the *Carabidæ*, most of which were taken on the ground and the pentatomids *Podops cinctipes* Say found among the flat, matted stems of *Juncus gerardi* and *Rhytidolomia saucia* Say in similar situations on *Spartina patens*. Four species of dragon flies were captured and of these, *Erythrodiplex berenice* D., appeared to be quite common. Of all the families listed, the *Cicadellidæ* was one of the best represented, some ten species having been captured, several of which were quite common. *Spartina patens*, *Distichilis spicata* and *Spartina glabra* seemed to be very attractive to fulgorids and cicadellids, some species occurring in countless numbers and whitening the foliage by their feeding. *Draculacephala mollipes* Say, *Hecalus lineatus* (Uhl.) and a species of *Thamnotettix* were rather plentiful. In the *Fulgoridæ*, *Aphelonema decorata* (Van D.), *Pissonotus aphidioides* Van D., *Oliarus humilis* (Say) were quite conspicuous.

In the Hemiptera, *Nabis ferus* L., *Trigonotylus ruficornis* Geoff., and *T. uhleri* Reut., were present in numbers. In the Coleoptera only a single specimen of the salt marsh tiger beetle, *Cicindela marginata* Fab., was taken. The staphylinid *Trogophlæus nanulus* Csy., was frequently captured and the only other species noted in numbers aside from those mentioned as feeding

on marsh elder, was *Hypera punctata* Fab., the clover leaf beetle. This curculionid was quite plentiful during the last of August and first part of September resting on erect stems of *Spartina patens* and on the upper portions of *Spartina glabra*. Mention should be made of the presence of *Sphenophorus setiger* Chit., and *S. venatus* Say which probably breed in reeds and grasses. In the Hymenoptera, the most plentiful species were *Chelonus sassacus* Vier. (*Braconidæ*), *Bassus* sp., *Hemiteles areator tenellus* Say (*Ichneumonidæ*), a species of *Eulophidæ* and a species of *Chloralictus*.

The best represented order was the Diptera with thirty-four per cent of the total number of species collected. Species present in large numbers were *Helobia hybrida* Meig., (*Tipulidæ*), *Aedes sollicitans* Wlk., (*Culicidæ*), *Nemotelus melanderi* Bks., (*Stratiomyidæ*), *Tabanus nigrovittatus* Macq., (*Tabanidæ*), *Sympycnus lineatus* Lw., *Dolichopus marginatus* Aldr., *Pelastoneurus lamellatus* Lw., (*Dolichopodidæ*), *Pipunculus scoparius* Cress., (*Pipunculidæ*), *Platychirus quadratus* Say, *Toxomerus marginatus* Say (*Syrphidæ*), *Myiophasia atra* D., (*Tachinidæ*), *Limnospila albifrons* Zett., *Lispa albitarsis* Stein., *Cænoscia lata* Wlk., (*Anthomyidæ*), *Leptocera limosa* Meig., (*Borboridæ*), *Chaetopsis ænea* Wd., *C. apicalis* Johns., (*Ortolidæ*), *Botanobia dorsata* Aldr., and *B. trigramma* Lw. The last mentioned species was present by millions and sometimes filled our nets almost to the exclusion of other species.

SUMMARY

The foregoing tables and text show that the salt marsh supports a varied insect fauna. Prof. John B. Smith (Insects of New Jersey, N. J. St. Mus. Rept. 1909, p. 30) writing about the coastal strip of New Jersey including the marshlands lying between the bars fringing the coast and the mainland speaks of the insect fauna as being scant. Used relatively as was probably intended, this is true, but the salt marsh of New Jersey is far from being devoid of species. The next two tables deal with the species present by orders and with the types of food habits, the latter being based for the most part on the predominating larval habits of the

families and on the species present, regardless of numerical abundance. The disadvantage of using the family as a unit is appreciated and this matter and that of numerical abundance have been gone into in a former paper.

INSECTS OF THE MARSH.

Order	Number of species	Per cent of total
Platyptera	1	
Neuroptera	1	
Odonata	4	2
Homoptera	24	11
Hemiptera	20	10
Orthoptera	5	3
Coleoptera	48	23
Lepidoptera	4	2
Hymenoptera	31	15
Diptera	72	34
Totals	210	100

TYPES OF FOOD HABITS.

	Number of species	Per cent of total
Phytophagous	82	39
Saprophagous	44	21
Harpactophagous	55	26
Parasitic	26	13
Pollen feeders	2	1

As shown above, in point of number of species, the Diptera are the most important, followed in turn by the Coleoptera, Hymenoptera, Homoptera and Hemiptera. As shown by the last table, in a general way and regardless of numerical abundance, 39 per cent of the species present can be classed as phytophagous, 21 per cent as saprophagous, 26 per cent. as harpactophagous and 13 per cent as parasitic. The phytophagous percentage is made up largely by the *Fulgoridæ*, *Cicadellidæ*, *Lygæidæ* and several species of Coleoptera, Orthoptera and Lepidoptera. The saprophagous percentage consists for the most part of members of the

Diptera and their presence on a marsh containing a large amount of organic matter is not unusual. Predaceous species were supplied mostly by the Diptera and Coleoptera followed by the Hemiptera, Hymenoptera and Odonata. The Hymenoptera and Diptera supplied all of the parasitic species. It is believed that a fair sample of the species present on the marsh was obtained and that the types of food habits indicated above, as being associated with the marsh vegetation described, will be found in approximately the same ratios in other similar marsh areas.

EXPLANATION OF FIGURES

- Fig. 1, A view of a stream (at low tide) on one side of the surveyed area showing the growth of *Spartina glabra* along the edges.
- Fig. 2, A general view showing the wide stream on another side of the surveyed area.
- Fig. 3, A view of the surveyed area showing *Spartina glabra* in the foreground. *Spartina patens* occupies a large proportion of the balance of the area.



Figure 1

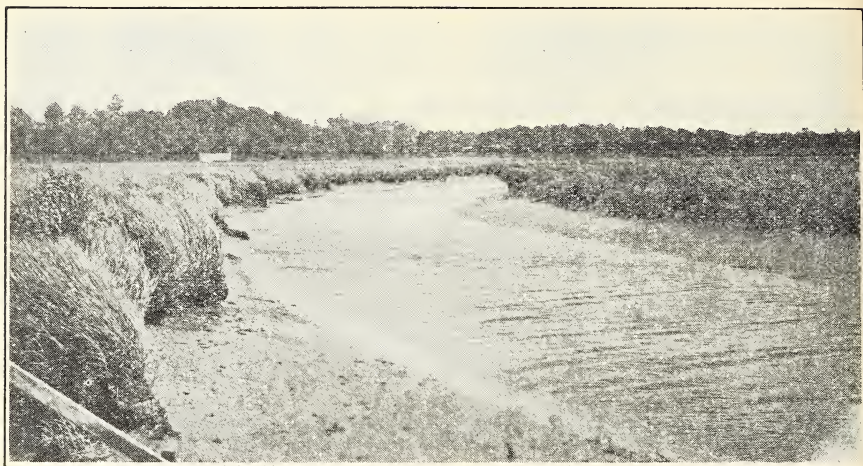


Figure 2



Figure 3

A NORTHERN FORM OF THE BUTTERFLY NEONYMPHA AREOLATUS

BY WM. T. DAVIS.

STATEN ISLAND, N. Y.

In the "Catalogue of Diurnal Lepidoptera Described by Fabricius in the Collection of the British Museum" by Arthur G. Butler, London, 1869, two butterflies by the name of "*Papilio Phocion*" are mentioned. One was described in 1781 and the other in 1793. In *Species Insectorum* 2., p. 138, n. 642 (1781), Fabricius described a butterfly from Africa which Butler figures on his plate iii and credits to Sierra Leone. He further states on page 274: "Two wings of the type still remain in the Banksian Collection; *P. Phocion* is figured in Jones's unpublished 'Icones'. Fabricius described three Hesperidæ under this name."

In *Entomologia Systematica* iii, p. 218, n. 683 (1793), Fabricius described the second *Papilio phocion* from an unknown locality. Butler, however, on page 15 of the work already cited, gives "United States" as the locality. In his "Catalogue of the Diurnal Lepidoptera of the family Satyridæ in the collection of the British Museum," London, 1868, he also mentions the United States as locality for this butterfly. Samuel H. Scudder in "The Butterflies of the Eastern United States and Canada" (1889), likewise dates the American *phocion* from 1793, and not 1781, as has been done by most authors. In "The Butterflies of North America," 3rd series, 1897, Wm. H. Edwards, for instance, cites the 1781 description by Fabricius of the African butterfly, and then translates the 1793 description, the one supposed to cover our North American species. Edwards, however, considered that the description itself was "inapplicable", and used the name *areolatus* given the insect under consideration by Abbot and Smith in 1797.

It is also the opinion of the writer that *phocion* is inapplicable, not for the reason given by Edwards, but because in 1793, when Fabricius named his second *Papilio phocion*, he used a preoccupied name.

We still have to consider the name *Oreas fimbriata helicta* given to the insect under consideration by Jacob Hubner in *Sammlung exotischer Schmetterlinge*, 1806. There is no description, but his plate shows an insect with lines and spots about as in figure 3 on the plate accompanying this article; that is the two brown lines extending across the central portion of each hind wing approach each other and are almost connected. This seems to be a rather uncommon variation, of which the writer has but the single example here figured. In his *Verzeichniss bekannter Schmettlinge*, 1816, p. 65, he states under number 622 "*Neonympha Helicta*. *Areolatus* Abbot. Lepid. 13 Hubn. *Oread fimb. Helicta*."

Turning then to "The Natural History of the Rarer Lepidopterous Insects of Georgia", by Abbot and Smith, we find figured on plate 13 three specimens of *areolatus*; two figures of the upper side and one of the lower. This last shows four round blackish spots encircled by yellow on each fore wing, and six elongate spots encircled by yellowish on each hind wing. The spots on the hind wing are of the shape of those shown in figures 1 and 2 on the plate accompanying this article.

Boisduval and Le Conte in *Lep. Am.* Sept., 1833, plate 63. show the spots as elongate on the underside of the hind wings in *areolatus*. Samuel H. Scudder in "The Butterflies of the Eastern United States and Canada" (1889) shows on plate 14 a *phocion* from Georgia with five elongate spots on the underside of the hind wings. Wm. H. Edwards in "The Butterflies of North America", 3rd series, 1897, shows the underside of *areolatus* in figures 2, 4, and 5. Figure 2 shows long spots; 4 with slightly more rounded spots, and figure 5 a variation having a reddish colored line surrounding the spots. In Holland's "Butterfly Book", plate 25, figure 7, there is a colored figure of the underside of a *phocion* showing elongate spots.

Many years ago the writer observed that the numerous specimens of *Neonympha areolatus* Abbot and Smith, that he collected at Lakehurst, New Jersey, had the eye-like spots on the underside of the hind wings rounder than in specimens coming from Florida and the south in general. He at the time communicated this fact to Mr. Frank E. Watson, now of the American

Museum of Natural History, who kindly compared the specimens at hand and confirmed the observation as far as could be done at the time. Comparing at the present time 22 specimens from New Jersey, 6 from Raleigh, North Carolina, 1 from Southern Pines, N. C., 3 from Charleston, South Carolina, 17 from Florida and 1 from Harris Co., Texas, the observation made as stated above is again confirmed, and it is also found that the yellow encircling the blue of the eye-like spots is lighter in color in the southern specimens than in those from New Jersey. Further in Entomological News, Vol. XIV, p. 297, Nov., 1903, Mr. Philip Laurent in "Notes on the Butterflies of Miami, Florida", makes the following statement: "*Neonympha phocion* differs from our northern examples, in the fact that the anterior wings are not as much produced, besides there are other characters which at once will enable the student to separate the southern specimens from the northern." According to our observation, northern specimens have the outer margin of the fore wing somewhat more rounded or curved than in those from the south. Perhaps this is equivalent to stating that the latter is more produced.

The northern specimens appear therefore to be separable as a variety or race from the southern ones, and the name *septentrionalis* is here proposed for it. Type specimen from Lakehurst, N. J. (July), figured as number 4 on the accompanying plate.

The writer does not mean to imply that specimens of *areolatus* from New Jersey and vicinity may not occasionally show spots resembling those from Florida and Georgia. He simply wishes to point out that there is a rather constant difference between those from the north and south.

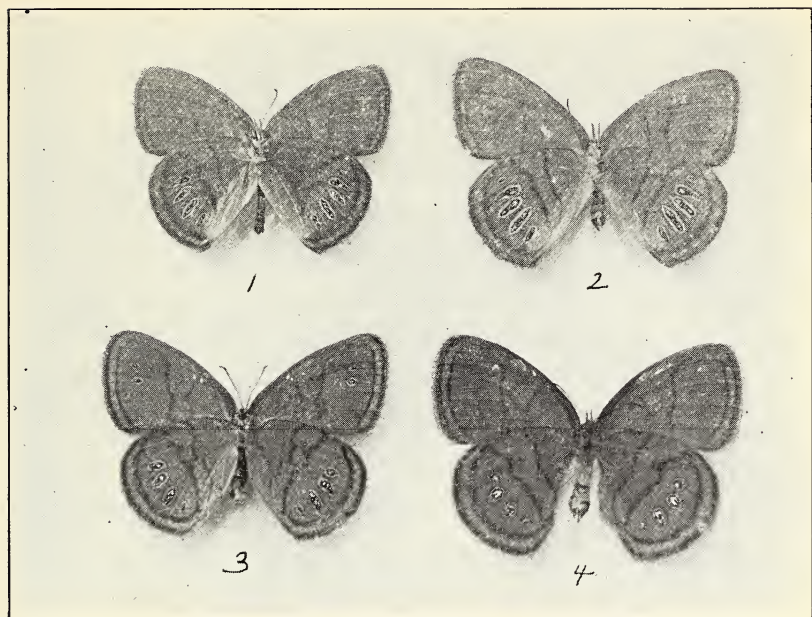
EXPLANATION OF PLATE X.

Fig. 1, *Neonympha areolatus*, Abbot and Smith, Lakeland, Fla., May 8, 1912.

Fig. 2, *Neonympha areolatus*, Lakeland, Fla., April 13, 1912.

Fig. 3, *Neonympha areolatus* (*helicta* Hubner), Southern Pines, N. C., June 13, 1920.

Fig. 4, *Neonympha areolatus*, var. *septentrionalis*, Lakehurst, N. J. July. Type.



NEONYMPHA AREOLATUS

NOTES ON POLYGONIA J-ALBUM, CERCYONIS
ALOPE, PHYCIODES THAROS, HEODES
EPIXANTHE AND EUPHYDRYAS
GILLETTI.

BY GAYLORD C. HALL.

Aglais j-album watsoni, new subspecies.

MALE: Differs from *j-album* Bdv., and Lec., in that the ground color is a richer fulvous and the dark markings larger. This gives the insect a darker appearance than the eastern form. Under side; the whitish outer band is strongly marked at the central line of demarkation between basal and outer halves of wings, and the band fades away rather abruptly and does not reach so far towards the outer margin as it does in the original type. The whole under surface is more variegated than the type, giving an affect of greater contrast between light and dark portions.

FEMALE: Upper and upper surfaces darker than the original type, the differences not being so great as in the male.

Polygonia j-album was described by Boisduval and LeConte who gave New York, Philadelphia and New Harmony, Indiana, as the localities where it was to be found. It is closely related to the European *l-album* Esp. and specimens from Eastern Mongolia resemble it very much. The American specimens, however, both eastern and western, are considerably larger and there are also minor differences.

This subspecies is named after Mr. Frank E. Watson of the American Museum of Natural History in recognition of many years of aid in the entomological field.

Type, male, Fig. 1, under surface. Taken at Sicamous, British Columbia on July 28, 1921 by G. C. Hall.

Allotype, female, same date and locality as type.

Type and allotype in the American Museum of Natural History. Paratypes 1, 2, 3, 4 and 5, males and 6 and 7, females in the collection of G. C. Hall.

Cercyonis alope ino, new subspecies.

MALE: Upper surface of wings dark. The two usual eye spots on the fore wing black, rather small, and containing small white pupils. Hind wing uniformly dark with the exception of inconspicuous marginal lines.

Under surface of fore wing; the two usual eye-spots conspicuous with fulvous outer rings and white centers. Under surface of hind wing; rather uniform in color, but area between marginal lines and center one, slightly lighter in shade and containing two minute eye-spots at and near the anal angle.

FEMALE: Upper surface lighter shade, the two eye-spots larger, with indication of yellow outer ring. Under surface fore wing; the two eye-spots ringed with yellow and containing large bluish pupils. Basal half of wing darker than outer half. Hind wing almost uniform in color, the basal half being somewhat darker. Two small eye-spots at and near the anal angle.

This form differs from *nephele* by the more uniform markings of the under surface, especially that of the hind wings, which in *ino* is to a large degree concolorous. Certain specimens present a hind wing without the slightest indication of the six spots and practically without any markings. In all cases the transverse striations are quite inconspicuous.

W. H. Edwards described *olympus* as the form found from Illinois to the eastern slopes of the Rocky Mts. *Ino* differs from *olympus* as markedly as it does from *nephele* which is found along the southern boundary of Canada to the eastern seaboard.

Type, male, Fig. 2, under surface. Taken at Calgary, Alberta, Aug., 1921.

Allotype, female, Fig. 3, under surface. Taken at Calgary on the same date.

Paratypes 1, 2, and 3, males and 4 and 5, females from Calgary. Paratypes 6, 7, and 8, males and 9 and 10, females taken at Starblanket, Saskatchewan by H. Hutchinson. All in the collection of G. C. Hall.

Type and allotype in the American Museum of Natural History.

***Phyciodes tharos pascoensis*, Wright, form vern. *herse*, new.**

Pascoensis was figured by Wright in his Butterflies of the West Coast and is the western representative of *tharos*. *Herse* is the Spring form of *Pascoensis* and corresponds to the eastern *marcia* Edw., differing from the summer forms by the darker markings, especially those on the under surface of the hind wing.

Type, female, taken at Taft, British Columbia on July 29, 1921 by G. C. Hall. Type in the American Museum of Natural History.

Paratypes 1, 2, 3, and 4, females, same date and locality, in the collection of G. C. Hall.

***Phyciodes tharos pascoensis*, Wright, f. ab. *nigrescens*, new.**

The fulvous ground color on upper surface of wings nearly obscured by black. Fore wing possesses an antimarginal row of fulvous spots and several near base. Hind wing has antimarginal row of fulvous blotches, most of which contain small black spots. Several basal spots are also present.

Type, female, taken at Taft, B. C., on July 29, 1921 by G. C. Hall. Type in American Museum of Natural History.

Heodes epixanthe phædrus, new subspecies.

MALE: Upper surface of wings much like *epixanthe*. Under surface lighter color, especially that of the hind wing which is a pearl gray, differing from that of *epixanthe* in which the color has an ochreous tinge. The spots on the hind wing are smaller and the marginal orange band near the anal angle is much reduced in size.

Epixanthe was described by Boisduval and LeConte from two specimens taken in New Harmony, Indiana. The specimens from central New Jersey and Massachusetts compare with their description.

Type, male, from Dublin Shore, Lunenburg Co., N. S. It is in the American Museum of Natural History.

Paratype, male, same locality. In the collection of G. C. Hall.

Paratype No. 2 from Crabbes, South-western Newfoundland. Taken by G. C. Hall and in his collection.

Euphydryas gilletti Barnes.

I believe this fine *Euphydryas* has never before been figured and I take this opportunity to show the upper surfaces of the male and female (Figs. 4 and 5). The specimens were taken the latter part of June, 1923, near Pinedale, Wyoming, and were found plentifully in the irrigated grass meadows at an elevation of 7,500 feet. Evidently the dates of emergence are from about the middle of June to the first part of July.

EXPLANATION OF PLATE XII.

- Fig. 1, *Aglais j-album watsoni*, ventral surface, male.
- Fig. 2, *Cercyonis alope ino*, ventral surface, male.
- Fig. 3, *Cercyonis alope ino*, ventral surface, female.
- Fig. 4, *Euphydryas gilletti*, dorsal surface, male.
- Fig. 5, *Euphydryas gilletti*, dorsal surface, female.



Fig. 1

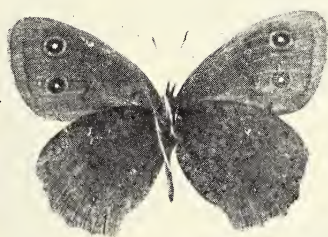


Fig. 2



Fig. 3



Fig. 4



Fig. 5

PAPILIONOIDEA

MISCELLANEOUS NOTES

Cicada-Killing Wasps and Flies: Lately Mr. A. E. Brower of Willard, Missouri, sent me a male *Cicada hieroglyphica* and a *Polistes pallipes* wasp with the following memorandum: "Heard the Cicada feebly crying and found it upon the ground with the enclosed wasp feeding upon it, July 4, 1923." The head and a part of the pronotum of the cicada are gone, evidently eaten by the wasp. *Polistes pallipes*, in my experience, usually confines itself, when on killing bent, to caterpillars and other soft bodied larvæ. In the present instance the wasp may not have overpowered the Cicada, but finding it disabled, began feeding upon it.

At Arrochar, Staten Island, on September 10, 1916, Prof. Wm. S. Wright, called my attention to a male *Tibicen chloromera* (*sayi*), lying on the ground and being devoured by the large naturalized wasp *Vespa crabro*. The cicada was still alive and struggling though all of its legs had been eaten off.

At Lakehurst, New Jersey, July 9th, 1911, the robber-fly *Proctocanthus nigriventris*, was observed in the act of seizing a *Cicada hieroglyphica* on the low limb of a tree about fifteen feet from the ground. The insects were secured by climbing the tree. At Key West, Florida, September 16, 1913, the robber-fly *Erax interruptus* was observed killing a *Tibicen olympus*. The specimens mentioned are in the writer's collection and the robber-flies are more nearly the size of the cicadas they captured than is *Polistes pallipes* the size of *Cicada hieroglyphica*.

In Entomological News, July, 1923, p. 212, A. B. Champlain and J. N. Knull in "Notes on Pennsylvania Diptera" state regarding the robber-fly *Dasyllis grossa*: "An adult of this large fly was observed capturing a specimen of *Tibicen sayi* S. & G. in midair, at Montebello, Pa. The cicada was probably twenty feet from the ground when it suddenly dropped to earth with the *Dasyllis*. In this case the prey was too bulky to carry off, as is the usual practice."

WM. T. DAVIS.

The Grape Leaf-hopper Infesting Sycamore: On September 5, 1919, at Riverton, N. J., last stage nymphs and adults of *Typhlocyba comes* Say, the grape leaf-hopper were observed on sycamore trees. The nymphs were feeding on the leaves and numerous cast skins indicated that they had occurred in numbers previous to the date of observation. Dr. E. D. Ball who identified the species stated that it was the type form and that during the season of 1919, it was abundant on sycamore at Ames, Iowa.

HARRY B. WEISS.

Errata: In the June, 1924, issue (vol. xxxii, No. 1) on page 76, line 38, for "1916" read 1906.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF MAY 15, 1923.

A regular meeting of the New York Entomological Society was held in the American Museum of Natural History at 8 P.M. on May 15, 1923. President Harry B. Weiss in the chair, and 17 members and six visitors, present.

Mr. Davis exhibited seven cards from Mr. Notman by which his westward journey as far as Marquette was traced.

Dr. Lutz spoke of aquatic spiders from England now living in an aquarium, of special interest because none such occurs in the United States.

Dr. Lutz delivered an address, illustrated by stereopticon views, on "Some Work on the Biological Relations between Flowers and Insects" reading in part from his discussions of "Flowers and Their Insect Visitors" in "Natural History" XXIII, 1923.

Mr. Leng exhibited some portraits of entomologists illustrated in part by lantern slides loaned by Mr. Weiss which formerly were owned by Prof. John B. Smith, in part by slides in possession of Staten Island Institute of Arts and Sciences.

Mr. Davis showed portraits of Schwarz, Barber, Caudell and Heide-mann.

MEETING OF OCTOBER 2, 1923.

A regular meeting of the New York Entomological Society was held at the American Museum of Natural History at 8 P.M. on October 2, 1923. President Harry B. Weiss in the chair with 19 members present.

Newspaper accounts of Mr. Notman's travels and collections were shown and 47 postal cards which he had sent to Mr. Davis from different points on his travels.

Mr. Harry B. Weiss was, on motion by Mr. Davis, delegated to attend the Joseph Leidy Commemorative Meeting.

Dr. Leonard spoke of the collecting done during the summer in the Adirondacks, especially on Mt. McIntyre during the last week in June, in which Messrs. Bishop and Crosby took part. Mr. Young also had collected many small species. At the summit of Mr. McIntyre the Diptera were very numerous in the sunshine; at Mrs. Wood's house near No. Elba, Mr. Watson's visits were remembered and a *Papilio* near race *canadensis* was found; at Artists' Brook near Chapel Pond, sphagnum, Labrador Tea, and fungus gnats were found while solid ice was still unmelted among the boulders.

Mr. Nicolay recalled his visit to the same region with Messrs. Notman and Quirsfeld last year when *Nomaretus bilobus* was found; and described his visits to Washington, D. C., with Messrs. Shoemaker, Quirsfeld and Mason, to Greenwood Lake and to the beach of New Jersey.

Mr. Angell spoke of a visit to Montauk where Bumble bees were found whining around the brush near the beach and two specimens of *Rhizophorus* were taken near by. He also showed *Cicindela generosa* and the green form of *tranquebarica*.

Mr. Wm. T. Davis stated that in company with Mr. Vosburgh and Mr. Leng he had spent some time during the summer in copying the grave-stone inscriptions in old St. Andrew's Church yard, Richmond, Staten Island. While so engaged he had observed a number of interesting insects. Numerous *Celtis* trees border the cemetery and attracted by them an occasional *Chlorippus clyton* butterflies. *Chlorion ichneumonae* had several burrows, and brought numerous nymphs of *Neoconocephalus* wherewith to store the underground chambers. They collected there long-horned grasshoppers in the low meadows that adjoin the cemetery. From one chamber, about the size of a hickory nut, seven *Neoconocephalus* nymphs had been taken. On August 31 the Rove-beetle identified by Mr. Notman as a species of *Gyrohypnus* was observed in numbers running about in circles on top of several grave stones. They were evidently pairing. On September 28, they were again present on the grave stones, but in less numbers. Mr. Davis further stated that the butterfly *Basilarchia astyanax* var. *albofasciata* had been seen by him and Mr. Leng at St. George, Staten Island on August 13, and the next day, either the same specimen or one much like it, had been brought to the Public Museum by two little girls who had captured it at St. George. Another *albofasciata* was seen by Mr. Davis and Mr. Ernest Shoemaker on the road south of Arlington, Staten Island on August 25. Several other specimens of this usually rare form, that had been taken previously on Staten Island, were also shown. Mr. Davis further exhibited a living male Mantid, *Paratenodera sinensis*, and stated that the species had now become fairly well established in several localities on Staten Island.

Dr. Lutz referred briefly to a trip he had made with Mr. Schwarz to the Everglades and to the continuance of his studies of the reactions of insects to color and especially to the ultra violet rays.

Mr. Bell spoke briefly of his visit to Yellowstone National Park and exhibited the Cicada *Okanagana bella* obtained there for Mr. Davis.

Mr. Watson had been occupied with local collecting for the museum, in which connection he gave his experience in collecting *Chlorippe clyton* and *Basilarchia albofasciata*; the latter he had never seen flying but slight transitions toward *albofasciata* were fairly common.

Mr. Hall said that near High Point in Sussex Co., N. J., he had once taken four in a day and altogether found eight. His principal summer trip had been to the mountains of Wyoming.

Mr. Barber had as usual spent some time in Virginia and had visited Lakehurst early in the spring where he had found much of the woodland burned. His studies in wild bed bugs indicated possibly two new species. He spoke also of the fine work by Dr. Knight on *Miridae* in Bull. 34 "Hemiptera of Connecticut".

Mr. Weiss had noticed an unusual abundance of lace bugs in which he was corroborated by Dr. Leonard. His particular task during the summer had been the study of two or three acres of salt marsh near Morgan where, in spite of a daily covering by the tides, diptera, coleoptera, etc., were abundant. He had also visited Lahaway once.

Mr. Dickerson in company with Mr. Bischoff had spent much time at Murray Hill and Berkeley collecting *Membracidae* and *Cicadellidae*.

Mr. Sherman reported on eight weeks spent at Randolph, New Hampshire with numerous trips to the summit of Mt. Washington, Mt. Jefferson and Mt. Adams. *Carabus chamissonis* was found on all these summits and in spite of the dry season butterflies were abundant. He mentioned several entomologists also whom he had met during the summer—Henshaw, Wheeler, Banks, and told of the sale of the Reynolds collection and library to Frank J. Souther, Chicago. Mr. Davis spoke of a letter from R. P. Dow which he would read at the meeting of the Brooklyn Entomological Society. Mr. Weiss told of the remembrances of him he encountered at Lahaway and Mr. Comstock spoke also of his repute among genealogists.

Dr. Leale closed the meeting with some recollections of Agassiz, whose pupil he had been, of Joseph Henry, and other famous people; and complimented his fellow members on their summer's work.

**STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.,
REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,**

Of The Journal of the New York Entomological Society, published quarterly at New York, N. Y., for April 1, 1924.

State of New Jersey, }
County of Mercer, } ss.:

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Harry B. Weiss, who, having been duly sworn according to law, deposes and says that he is the editor of the Journal of New York Entomological Society and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—New York Entomological Society, American Museum Natural History, New York, N. Y.

Editor—Harry B. Weiss, 19 North 7th Avenue, New Brunswick, N. J.

Managing Editor—None.

Business Managers—None.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent. or more of the total amount of stock should be given.) New York Entomological Society, American Museum Natural History, New York, N. Y.

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5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise to paid subscribers during the six months preceding the date shown above is.....
(This information is required from daily publications only.)

HARRY B. WEISS, Editor.

Sworn to and subscribed before me this 16th day of April, 1924.

AUGUSTA JOHNSON.

My commission expires Dec. 28, 1927.

The New York Entomological Society

Organized June 29, 1892.—Incorporated June 7, 1893.

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Avenue.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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OF THE

New York Entomological Society

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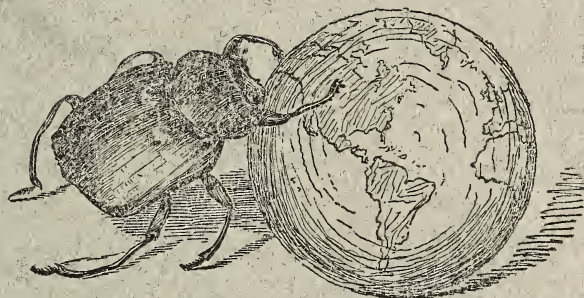
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September, 1924

No. 3

JOURNAL
OF THE
NEW YORK
ENTOMOLOGICAL SOCIETY.

Devoted to Entomology in General.



SEPTEMBER, 1924

Edited by HARRY B. WEISS

Publication Committee.

HOWARD NOTMAN
J. D. SHERMAN, JR.

F. E. LUTZ
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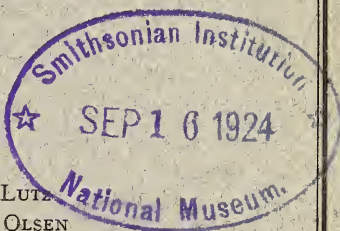
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NOTICE: VOLUME XXXII, NUMBER 2 OF THE JOURNAL OF THE NEW YORK ENTOMOLOGICAL SOCIETY WAS PUBLISHED ON JUNE 15TH, 1924.	

JOURNAL

OF THE

New York Entomological Society

Vol. XXXII.

September, 1924

No. 3

THE AMARANTH CURCULIO, CONOTRACHELUS SENICULUS LEC.

BY F. H. CHITTENDEN.

Some years ago, during the first week of September, the writer noticed that a variety of cultivated amaranth (*Amaranthus* sp.), growing at Washington, D. C., was dying, many large and otherwise beautiful plants being prostrate. Some, though rooted to the ground, had fallen over. Examination of the main roots disclosed large numbers of larvæ of what proved on rearing to be *Conotrachelus seniculus* Lec., working about the base. When the earth about the roots was examined later, larvæ were found to have issued from them and pupæ had also formed. Infestation through the entire planting was practically complete, 90 per cent. at a low estimate. Some plants showed a form of root rot which might have attacked the plants after the insects had been at work. By the third week of September, larvæ had become comparatively scarce and many pupæ were in the ground about the roots, and by the end of the month most of the adults had developed, numerous holes showing where they had emerged from the ground.

The first adult was reared September 28, but it was not completely hardened or mature until October 7. Beetles continued to mature until the end of October.

The larval habits of this species were recorded by the writer in 1898¹. During August, 1897, numerous larvæ and pupæ were found about the roots and in the earth around the stems of rough pigweed (*Amaranthus retroflexus*). Unfortunately, the species was mentioned in that record as *C. elegans* Say.

¹Bul. 18, n. s., Div. Ent., U. S. D. A., pp. 95, 96.

In two localities in Maryland that were visited, a large proportion of the wild *Amaranthus* examined was infested. Larvæ were most numerous on mature plants within an inch or two of the surface, and the stems were considerably eroded where larvæ were at work. A dozen or so individuals usually comprise a colony about each wild plant, but ornamental amaranths harbor many more.

The first larva transformed to a pupa August 11, and the first imago appeared on August 18, having passed six and a half days in the pupal condition. Larvæ and pupæ, as would naturally be inferred, very closely resemble those of *Conotrachelus nenuphar* Herbst., or the plum curculio. A cell is formed for the pupa, but is of such rude construction that it is scarcely noticeable. The beetles have been collected about Washington late in May and early in June and are not so frequently seen in September and October, although abundant at the later date. Dr. W. D. Pierce, who identified the species, says that he has found the larvæ in amaranth roots in Texas, but did not succeed in rearing the adult.

The close resemblance of this species to *elegans* Say., has undoubtedly caused the two to be somewhat generally confused in collections. The following distinctions have been pointed out to the writer by Dr. Pierce:

Upper surface with short, erect setæ; prothorax distinctly carinate from apex to base.

Posterior femora with a large acute tooth and a small denticle
seniculus Lec.

Upper surface without erect setæ; prothorax with feeble carina.

Posterior femora with two small denticles.....**elegans** Say.

Of the latter species, which has been called the "pig-nut leaf-weevil", Packard has written:¹ "We have observed this weevil at Providence (R. I.) busily engaged the last of May laying its eggs in the partly rolled up leaves of the pig-hickory (*Carya glabra*), and, during the process, cutting off the leaves, which hang down, wither, and turn black."

¹Packard, A. S.—Fifth Rept., U. S. Entom. Comm., p. 316, 1890.

The difference in the larval food habits of the two species will be noted, the one being a root- and stem-feeder, the other, according to Hamilton², a leaf-roller.

MIGRATION OF PYRAMEIS CARDUI

The 1924 annual migration of *Pyrameis cardui* in this region is beyond doubt the largest on record. The butterflies began to struggle across the border from Baja, California, about February 27, and soon became very abundant for seventy miles or more, or from coast to Colorado River. Today, March 15, the migration is about completed in Los Angeles County, the mass having crossed successfully the mountain range varying from 3,000 to 8,000 feet and getting into the Mohave and Ventura valleys. Most of the specimens were much worn but occasionally one was seen evidently freshly emerged. Their path was on the whole from the southeast, probably their direction following the low lands as far as possible. Food was abundant, the apricot and orange trees averaging from 25 to 100 specimens at any hour of the day. In the air they were not as numerous as one sometimes sees *A. plexippus* in its similar migration in the east. They were, however, constant. At any given point in open space one could count from 50 to 300 a minute and the speed of flight averaged not far from 15 miles an hour. Moreover, these numbers hold good for at least 1,000 square miles and they were not less numerous at the 5,000 feet levels than in the low lands; besides, there was no diminution of numbers between sunrise and sunset. One can easily imagine that the total number of them living at one time in three counties is larger than the human population of the entire world.

R. P. DOW, *Sierra Madre, California.*

²Hamilton, J. A.—Trans. Am. Ent. Soc., vol. XXII, 1895, p. 376.

NOTES ON CYCHRUS AND THE SAD MISFORTUNES
OF AN ENTOMOLOGIST*

BY CHARLES DURY,

CINCINNATI, OHIO.

In regard to *Cychnus heros*, I have not seen one alive for years and only saved four from Kentucky, no two of which are alike. Over in Campbell Co., Kentucky, opposite Cincinnati, across the Ohio River, at one time they occurred in numbers. We laid flat stones along the edge of a bit of woods and got about seventy-five by going to the traps every day. The late Charles Siewers once had about twenty-five pinned on a board and put them in the warm oven to dry. His wife started a fire and roasted the whole bunch. He never remembered them until he smelled something burning. He lived near the locality and so was able to get many more than I did. I gave my duplicates away until only the four were left. After Siewers' death I never collected over there so don't know if they can be found there or not. I have taken single specimens in eastern Kentucky and near Chattanooga, Tennessee, but they differ from the Cincinnati form, which varies in color from bright deep blue to purple, and the thoracic shield is shaped differently. Mr. Ernest Shoemaker of Brooklyn, N. Y., sent me two *shoemakeri* from Virginia. They belong to this complex. Mr. H. P. Loding, of Mobile, gets them in north Alabama, though I don't know how abundantly. A long series from Virginia, Tennessee, Kentucky, and Ohio, will show that these are all the same species.

At Cumberland Gap, Tennessee, *Cychnus* were once abundant, but the last time I was there I found the country had been all burned over and I was able to find only one variety of *heros* and two other smaller species. On the Ohio side of the river *C. heros* is decidedly scarce, as are the other three species taken here, namely, *canadensis*, *lecontei* and *gemari*. I once chopped about

*These notes were originally sent to Warren Knaus, McPherson, Kansas, in the form of a letter.

thirty *gemari* out of a large log in Clermont Co., Ohio. Two years ago I visited the same woods, but did not find any, although the woods is yet intact. May and early June is their time.

After Siewers roasted his *Cychrus*, I went over one day and brought a box of specimens for him. To clear the small table, he placed a board on which he had pinned five or six *Cychrus heros* and a lot of *Dryobius*, collected the day before, on his chair. After looking at the things I had brought, he forgot his board and sat down on it! He jumped up with a yell, but the specimens were ruined, and the seat of his pants was bristling with pins and beetles. He was one of the most successful collectors I ever knew, but his material never benefitted him or anybody else.

1923 COLLECTION AND LIFE HISTORY NOTES ON STRATEGUS MORMON

By W. KNAUS,

McPHERSON, KANSAS

The writer has collected *Strategus mormon* Burm. for many seasons, in the Sandhill pasture region southwest and southeast of Medora, Reno County, Kansas, adjacent to the valley of Little River. The first season only two specimens were taken, but it was a season or two later before the species was recognized and was found to be in but few collections in the world. This knowledge made it desirable to collect, but success was variable. Some seasons none were found. Other seasons a half dozen or a dozen might be taken, but never enough to supply the demand. The season of 1922 yielded the most specimens up to that time, but 1923 was the record collecting season for this species. The first specimens were found about May 15, and the last ones were taken about July 6.

This past season, however, started abnormally early. A male specimen was picked up by a friend, Mr. Kenneth Krehbiel, about 18 miles south of McPherson, on April 8. No more were seen however until more than five weeks later when they began to appear in the horse and cattle pastures near Medora. Always the first specimens found were males. Careful observation the past season revealed that of the first thirty specimens taken in May, only 5 were females. After the tenth of June, the females increased rapidly, and by the twentieth of June the sexes were approximately equal.

My conclusion, after examining many burrows, is that the male appears from 5 to 15 days before the female. He selects the place for a burrow, choosing preferably a horse dropping from six months to a year old—nothing recent is attractive. He forces his way with his powerful head and fore legs into the sand or soil close beside or under the dropping, burrowing to a depth of from 4 to 12 inches according to the location and quality of the sand or soil. He does not throw the sand to the surface, but

packs it or crowds it outward from his body, until the hole is sufficiently large. At the bottom an enlargement is made, sufficient to contain the food, consisting of shredded horse or cow droppings, that is taken down the burrow by the female when she finds a mate who has built the house for the family. After the food for the future family is stored in the bottom chamber, and several eggs, between a sixteenth and an eighth of an inch in length, and a little more than a sixteenth of an inch in diameter have been deposited in the food mass, they either drive other burrows, and stock them, or move to a new location and set up another home.

Almost always in May and the first 10 days in June one male is found in the burrow. After that a female, and a male, and occasionally a female and two males, and rarely two pairs, may be found at the same location, but always two burrows are occupied. By the first week in July only an occasional female is found alive in the burrow and after that time, remains of dead *Strategus* show that the season is over. *Strategus mormon* is a day flier, his flight being somewhat slow and noisy. I have taken none at night, although many species of *Scarabeidæ* are exclusive night flyers. The season of 1923 yielded more specimens of *Strategus* in three or four pastures adjacent to Medora than had been taken in all the seasons previously.

A COLOR FORM OF *CICINDELA REPANDA-UNIJUNCTA*

BY W. KNAUS,

McPHERSON, KANSAS.

Recently I received from Mr. D. K. Duncan, of Globe, Ariz., a striking form of *Cicindela repanda-unijuncta*. The specimen is a male, slightly smaller than the average *unijuncta*, and bright green-blue in color.

The head, thorax and sutural area of the elytra, green, shading into blue-green around the white elytral markings, legs green, under side green to bluish purple. Except for the color, and size, it does not differ from typical *unijuncta*. Length 9 mm., width 3 mm.

To distinguish this color form, when other specimens come into the hands of collectors, I propose the name, *duncani*, in honor of the collector. The type specimen was collected near Phoenix, Ariz., and is now in my collection.

GALLS OF *APION HIBISCI* FALL (COLEOPTERA)

At Seaside Park, New Jersey, on April 17, the old, globular galls of this species were noted on the dried stems of the swamp rose mallow *Hibiscus moscheutos* L. *Apion hibisci* was described by Prof. Fall in the "Journal of the New York Entomological Society" (Vol. XXVI, p. 219), in 1919, from specimens collected at Arlington, New Jersey, on rose mallow growing along the edge of a marsh and the Seaside Park record is the first since its description. Both localities are on the New Jersey coast some sixty miles apart. At the time the species was found at Arlington, a search was made for it on rose mallow growing at inland points of New Jersey but the results were negative.

H. B. WEISS.

NOTES ON THE ORTHOPTERA OF THE EASTERN UNITED STATES

BY W. S. BLATCHLEY,

INDIANAPOLIS, INDIANA.

Since my "Orthoptera of Northeastern America" appeared in May, 1920, a number of notes on the distribution, habits, etc., of certain species have accumulated. In order that our knowledge of this interesting order of insects may be kept somewhat up to date, I have brought these together in the present paper. I have also made brief mention of such new species and varieties as have been described by other authors from the territory covered by that work since its appearance. The serial number before the name of each species is that of the same species in the "Orthoptera."

(2). *Anisolabis annulipes* (Lucas). Since 1920 this earwig has been taken in numbers at Dunedin, Fla., from beneath and in decaying grape fruit and in piles of rotting unhulled rice.

(.). *Anisolabis (Euborellia) ambigua* Borelli. Hebard¹ has recently recorded the taking of a number of specimens of this West Indian form from beneath tidal litter along the edge of a mangrove swamp near Miami, Florida.

(10). *Doru aculeatum* (Scudder). While hunting near Indianapolis for *Donacia* on skunk cabbage, *Spathyema fætida* (L.), I took on May 1, 1921, 42 specimens of this earwig from between the bases of the leaves of the plants. They were below the surface of the ground, one to five in each clump of the plant, though usually in pairs, resting head downward in the groove which extends along the petiole of the leaf. Associated with them I found ten specimens of the chrysomelid beetle, *Donacia rufa* Say, and examples of several other species of beetles. I believe that the natural habitat of a number of our inland species of earwigs will be found to be between the base leaves and stems of grasses, sedges and other plants in damp localities.² From this retreat they emerge only at night in search of food.

¹Trans. Amer. Ent. Soc., XLVII, 1922, 321.

²See Orthoptera of N. E. America, p. 57.

(39). *Arenivaga floridensis* Caudell. Two additional males of this Floridian roach have been found near Dunedin. They were taken in April while flying low along sandy roadways in the pine woods.

(57). *Manomera blatchleyi* (Caudell). W. T. Davis³ has recently described an eastern race of this species under the name *Manomera blatchleyi atlantica*. His specimens (females only) were from Staten Island, Long Island, New York, New Jersey, Connecticut and Virginia. From typical *blatchleyi* it differs mainly in its broader and more tapering head, longer legs and shorter cerci.

(60). *Megaphasma denticus* (Stal). The first known Indiana specimens of this giant walking-stick were taken at Wyandotte, Crawford County, on August 2, 1921. A male, 105 mm. in length, was found crawling slowly along a woodland path-way and two others on the ceiling of the hotel porch.

(64b). *Nomotettix cristatus floridanus* Hancock. The second known example of the long or caudate form of this grouse-locust was taken March 30, 1920, while sweeping herbage in a cypress swamp on the margin of Lake Istokpoga, Florida.

(76). *Paxilla obesa* (Scudder). A single male of this bulky species was swept from the same swamp at Lake Istokpoga. It was the first specimen I had taken personally during all my collecting.

(79.) *Tettigidea armata* Morse. A female of this form was taken at Moore Haven, Florida, on March 24.

(102). *Ageneotettix deorum* (Scudder). The known range of this species has been extended eastward by Hubbell,⁴ who records the taking of a specimen at Three Oaks, Michigan.

(105). *Mecostethus platypterus* (Scudder). A number of specimens taken at Cambridge, Nebraska, July 19, 1921, have been sent me by A. P. Morse. Not before recorded west of Iowa and Minnesota.

³Journ. N. Y. Ent. Soc., XXXI, 1923, 52.

⁴Occasional Papers of the Museum of Zoology, Univ. of Mich., No. 116, 39.

(145). *Hesperotettix pratensis* Scudder. I was surprised to find, on August 4, 1921, several specimens of this handsome little locust by the side of a roadway running along a high wooded ridge near Wyandotte, Crawford Co., Ind. This county is in the extreme southern end of the State, adjoining the Ohio River. The only other Indiana localities previously known were in Lake County, adjoining Lake Michigan, where it occurs only in swales or low marshy tracts between the sand dunes. The tegmina of these southern upland examples were shorter than in those from the marshlands of the North, but the form of prosternal spine, of hind margin of metazona and of supra-anal plate of male are very distinctive in the species and differ conspicuously from those of *H. brevipennis* (Thos.).

(160). *Melanoplus viridipes* Scudder. Morgan Hebard,⁵ of Philadelphia, has, both in Mss. and in print, taken occasion to caustically criticise my treatment of this and allied species, and has described (loc. cit.) a new eastern race. *M. v. eurycercus*, using in part as cotypes, material I furnished him from Indiana. As stated by me in my notes on this species (p. 367 of the "Orthoptera"), some of the cotypes of Scudder's *viridipes* came from a colony discovered by me in Vigo County, Indiana. One of Morse's cotypes of *M. deceptus* came from this same colony. The species occurs mainly in isolated colonies of 30 to 70 or more in open blue-grass wooded pastures. It is very probable that these colonies emerge from one or two egg masses deposited by the same female. From such a colony occupying not over 100 square feet in a pasture of Marion County, Indiana, I have taken numerous examples which showed all the variations of the male cerci on which were based the three forms, *viridipes* Scudder, *deceptus* Morse, and *eurycercus* Hebard. The females of these forms are absolutely inseparable, as is admitted by Hebard (loc. cit., p. 394). If the egg pods of a single female, or of two or three females which originally came from the same colony, give rise to males whose variation in cerci is such as to lead to the founding of three species or races, where is the hair-splitting of nomenclature to end?

⁵Trans. Amer. Ent. Soc., XLVI, 1920, 357, 393.

Hebard (loc. cit., p. 393) states that "from over the wide range of *viridipes* eastward from Lake Co., Indiana, not a single male before us shows a cercal development intermediate in character between the typical condition of *viridipes* and *eurycercus*"; yet on the very next page he says "the males before us from Ann Arbor, Michigan, are intermediates, referable to *v. eurycercus* but showing distinct variation toward *v. viridipes*." Ann Arbor is 165 miles east of Lake Co., Indiana.

Hubbell (loc. cit., p. 50) states that all but two of the 31 males of *viridipes* taken by him in Berrien Co., Michigan, are of a type intermediate between typical *viridipes* and *eurycercus*. Although I may not be able, as Hebard claims, "to recognize the true value of species or races wherever finesse or elaborate analysis is necessary," I do not believe in trammeling nomenclature by giving a new name to every individual that has an extra spot on its side or an extra curve in its tail.

(.). **Melanoplus calloplus** Hebard. Under this name Hebard (loc. cit., p. 398) describes and refers to the Gracilis Group a form from Collison Ridge, Bath Co., Virginia, which he calls "an annectant type between *M. similis* Morse and *M. viridipes* Scudd."

(.). **Melanoplus alabamæ** Hebard. This name is given by Hebard (loc. cit., p. 374) to a form taken at Evergreen, Conecuh Co., Alabama. He states that it is very closely related to *M. querneus* R. & H., "differing apparently in the slightly smaller size and slightly more slender form, but strikingly in the shape of the male cerci."

(.). **Melanoplus tunicæ** Hebard. From Strickton, Rankin Co., Mississippi, Hebard (loc. cit., p. 370) describes a form under this name. He states that it differs from *Melanoplus ponderosus viola* Thos. in its "slightly more slender form, average longer tegmina, usually somewhat more solid coloration and distinctive male cerci."

(194). **Melanoplus flavidus** Scudder. Hubbell (loc. cit., p. 53) records this species from Berrien Co., Michigan, this being its most eastern known station and the first record for that State.

(258). *Orchelimum volantum* McNeill. The known range of this species has been extended eastward to New Jersey by Dr. H. Fox⁶, who took specimens near Rancocas and Delanco, that state, in August and September, 1920. Its most eastern station hitherto recorded was Cedar Point on the shore of Lake Erie, Ohio.

(264). *Conocephalus nemoralis* (Scudder). This species has been taken in Berrien Co., Michigan, by Hubbell (loc. cit., p. 65), this being the first and only record for that State.

(269). *Conocephalus attenuatus* (Scudder). Dr. Fox reports (loc. cit., p. 268) the taking of this meadow grasshopper at several localities in New Jersey. Its former most eastern station was Cornwells, Pennsylvania.

(273). *Conocephalus viridifrons* Blatch. According to Hubbell,⁷ this little meadow grasshopper occurs in numbers in the eastern part of North Dakota, where it was found in dry fields and pastures in company with, but even more numerous than, *C. fasciatus* (DeGeer).

(337). *Oecanthus exclamationis* Davis. In fulfillment of my prediction (p. 719 of the "Orthoptera") that this species "doubtless occurs in Indiana," specimens were taken in Knox County September 13, 1920, and July 5, 1921; also in Marion County in July and August of the latter year. All were swept from low shrubs in dense woodlands.

(.). *Oecanthus nigricornis argentinus?* Saussure. Among specimens of *O. n. quadripunctatus* taken in Knox Co., Indiana, on Sept. 18, 1922, I found several having a shorter, broader body than that variety and with the outer black mark on basal joint of antennæ larger and set almost at right angles to the inner one; while the two on the second joint were shorter, thicker, subequal in length and with their lower ends converging to form a rough V. As I could not determine them satisfactorily from the literature at hand, I sent them to A. N. Caudell of Washington, who wrote that "they are what I call *O. nigricornis* var. *argentinus*

⁶Ent. News, XXXII, 1921, 265.

⁷Occasional Papers of the Museum of Zoology, Univ. of Mich., No. 113, p. 49.

Sauss.", and he stated that he had specimens from a number of the Western States and from Delaware; also that breeding, as shown by Houghton⁸ had proven them to be intermediate between typical *nigricornis* Walker and *quadripunctatus* Beut. That this is their status, there is probably no doubt, but that they are the form described by Saussure from La Plata, Argentina, is strongly problematical. His description⁹ calls for a species very similar to *O. niveus* but having joints 1 and 2 of antennæ with a *single* black line beneath. He afterward treated a species under that name more fully in the "Biologia" (1897, p. 263, not to me now available), where, according to Caudell,¹⁰ there was "considerable variation from his original description in the length of the wings and the marking of the antennæ." As Caudell originally determined the United States form from Texas specimens and from the Saussure literature without comparison with the types, he may have been mistaken in its naming, as he infers when he says "specimens of what I take to be this species," etc. As individuals with the peculiar markings of the antennæ, as described above, will probably be found at various points in the Eastern States, I have mentioned these facts in order that they may be properly placed.

(341). *Neoxabea bipunctata* (DeGeer). Within the past three years this species has been taken in some numbers in Knox, Putnam and Marion Counties, Indiana, while sweeping vegetation in low alluvial woodlands along streams. At the time of writing the "Orthoptera" I had taken but two specimens in over thirty years' collecting in that state.

(349). *Hapithus agitator* Uhler. A female of this species with a pupal case of a parasite, almost as large as the body of the host, attached to the abdomen, was taken in Knox Co., Indiana, Sept. 18, 1922. Through Mr. Caudell the parasite was determined by Mr. Rohwer as probably the hymenopteron, *Rhopalosoma poeyi* Cresson. Specimens of that parasite from the same species of cricket have been reared by J. D. Hood of Washington, D. C.

⁸Ent. News, XX, 1909, 274; Can. Ent., XLI, 1909, 113.

⁹Mission Scientifique au Mexique, 1874, 460.

¹⁰Proc. Ent. Soc. Wash., V, 1903, 166.

CORRECTIONS AND COMMENTS HEMIPTERA-HETEROPTERA

By H. G. BARBER,

ROSELLE, N. J.

In the course of time, since the publication of Van Duzee's Catalogue, I have made note of some corrections and changes which it is necessary to make in certain of my articles. Some of the errors are typographical, due either to lack of opportunity to read proof or to read it with sufficient care.

1911—Jour. N. Y. Ent. Soc. XIX, p. 27. Dr. Bergroth, Proc. Roy. Soc. Victoria (N. S.), Part I, p. 15, 1916, in a foot-note remarks that "the North American *Esuris castanea* Barber does not belong to this genus is clear from several characters." From further study of two macropterous specimens, not discovered at the time of making the original description, I am inclined to agree with this conclusion.

Neosuris, new genus.

The entire body is somewhat shining and for the most part closely and distinctly punctate, the punctures set with fine inclined hairs. The head is wider than long, closely and evenly punctate; ocelli absent in the brachypterous form, set far apart and close to the eyes in the macropterous form. Antennæ mediocre with basal segment short, surpassing the head by one-half its length, terminal segment slightly incrassate. Rostrum with the first segment about reaching the base of head, nearly as long as second which is a little shorter than the last two taken together. Pronotum with the lateral margin dorso-ventrally obtusely rounded, not carinate; the propleuræ punctate within the lateral margins; in the brachypterous form the pronotum is widest before the middle from whence it is gradually contracted posteriorly, narrowest just before apical margin, with no evidence of a transverse sulcus, evenly and closely punctate except along apical and basal margins; in the macropterous form the anterior lobe is not set off from the posterior lobe by a sulcus, the former nearly twice as long and somewhat narrower than the latter which is differentiated by its coarser and sparser punctation; the posterior margin is lightly arcuated. The scutellum is almost an equilateral triangle, somewhat elevated across the base and evenly punctate. The hemielytra are rather coarsely and evenly punctate throughout. In the brachypterous form the clavus and corium are connate and level with the scutellum, with the suture between indicated by a line of punctures; the area of the clavus provided with about four irregular rows of punctures; the corium is

enervose; the membrane is represented only by a very narrow border along the obliquely truncated margin. In the macropterous form the membrane reaches the apex of the abdomen with the clavus distinctly demarked and provided with three regular rows of punctures; commissure about one-half the length of the scutellum. The anterior femora are rather strongly incrassate and armed beneath with a few small teeth; the anterior tibia are considerably curved and expanded at apex; the intermediate and posterior femora are moderately incrassate; the posterior tarsus with the basal segment much longer than the last two taken together.

Type *Neosuris castanea* Barber.

1911—Journ. N. Y. Ent. Soc. XIX, 29. I can not concur in the conclusion of Prof. S. B. Fracker (Ann. Ent. Soc. Amer., xi, 270-271, 1918) that my *Alydus rufescens* is a variety of *A. conspersus* Montandon. It is no doubt very closely related to Montandon's species but its general facies, behavior and range are sufficiently striking I believe to mark it as a distinct species even if the genitalia are of the same general type. In this subfamily, as in many of the *Coreidæ*, the genitalia are subject to a great deal of variation, quite as much in fact as any other bodily parts. The pronotum is more deeply punctate and much less pilose in *rufescens*. The differences in coloration are very striking.

1914—Bull. Am. Mus. Nat. Hist. XXXIII, 509, line 22, change *Lygæus albulus* Dist., to *Lygæus tripunctatus* Dallas.

1914—Journ. N. Y. Ent. Soc. XXII, 167, line 5 in the synopsis of the species should read—pronotum much longer than wide.

1918—Proc. Ent. Soc. Wash. XX, 108, line 6 from bottom should end as follows: beyond apex of head. Line 5 from bottom should begin: Fore femora. Page 109, line 14 from bottom should read: collected by H. S. Barber.

1918—Psyche XXV, 74, line 9 from bottom should read: *Myodocha* Latr. Page 78, last line. *Neosuris* Barber. Page 81, line 18, should read: *Plinthisus* Fieb.

1918—Journ. N. Y. Ent. Soc. XXVI, 51, line 13 should read: *Neosuris* Barb. I believe that *Esuris fulgidus* is correctly placed.

1918—Bull. Bklyn. Ent. Soc. XIII, 37, line 26 should read: collected by Mrs. W. P. Cockerell. Professor Cockerell writes me that he published a note concerning this *Blissus occiduus* in Ent. News XVI, 308, 1905, in which he pointed out the characters.

1914—Bull. Am. Mus. Nat. Hist. XXXIII, 513; 1921—Journ. N. Y. Ent. Soc. XXIX, 114. I have recently seen a mature female specimen of *Ligyrocoris slossoni* taken by Professor W. S. Blatchley at Dunedin, Florida. There is no doubt that it represents a distinct species and my description of the species in the first-named publication, based upon an imperfect and immature specimen, may be amended in some particulars. The head is reddish-castaneous; the eyes so placed that the lateral post-ocular part of the head is subequal to the space between the eyes and the apex of the antenniferous tubercles; the post-ocular part being gradually contracted. Pronotum constricted just back of the middle, with the anterior impunctate lobe only a little longer than the posterior lobe, the former piceous very sparsely setose, the latter reddish-castaneous, sparsely and irregularly punctate, with faint traces of four paler longitudinal fascia; the collar reddish. The sternum piceous with the acetabulæ and posterior angle of propleura paler. The femora are castaneous, paler towards the base. The scutellum is dull piceous, pale at apex, punctate only along sides towards apex. The corium is pale stramineous rather heavily marked with fuscous as follows: an irregular post-median transverse fascia which incloses two pale spots close to the apical margin of corium, the outer sub-apical one is much larger and sparsely punctate with ferrugineous; the apex of the corium infuscated; the area before the transverse fascia as well as the clavus streaked with fusco-ferrugineous, leaving the extreme base, the costal margin to well beyond the middle and several discal streaks pale. Length of female 6.5 mm.

This species should be placed in my key in section 15 close to *sylvestris*.

1921—Proc. Ent. Soc. Wash. XXIII, 66 and 68. *Lygæus niger* should read *rubriger*.

1922—Circular No. 54, N. J. State Dept. Agric., p. 16, No. 7, should read: *Corythucha pallipes* Parshley. Page 17, line 11, should read: (=parshleyi Gibson). Page 17, line 31, and page 22, line 17: *Baptisia* misspelled. Page 23, line 17 from bottom, should read: =?lurida Stal vide Parshley.

1923—American Mus. Novitates No. 75. Dr. Bergroth has called my attention to two necessary corrections in my paper on the Hemiptera of Porto Rico. *Orthaca intermedius* n.n. for *feruginosa*, preoccupied.

Neogorpis, new genus for *Gorpis neotropicalis*.

The body is more slender than in *Gorpis*. The head is elongate, cylindrical and porrect, subequally long as the anterior lobe of the pronotum; anteocular part of head much longer than the postocular, the latter more swollen; ocelli absent. Rostrum shorter than in *Gorpis* reaching only to apex of prosternum, second segment about one-third longer than third. Antennæ long and slender, inserted midway between apex of head and eyes, first segment nearly as long as head and anterior lobe of pronotum together and about two-thirds as long as second segment, the last two segments capillaceous, with the first of these much longer than the ultimate. Pronotum dull, not pilose, much longer than wide; collar very wide, not sharply delimited; anterior lobe a little longer and little narrower than the posterior lobe, impunctate; humeral angles unarmed. Scutellum swollen, elongate, impunctate, almost twice as long as wide, apex not laterally contracted, slightly obtuse. Hemelytra very elongate, a little longer than the abdomen, impunctate, very convex, parallel sided; commissure about four times as long as scutellum; membrane not plainly demarked from the corium, the latter provided with two veins the inner one forked opposite to apex of commissure; veins of the membrane very faint. Propleuræ as seen dorsally much dilated; anterior acetabulæ excised before middle of prosternum, closed behind; anterior coxæ elongate; legs elongate with the anterior femora somewhat incrassate, densely setose beneath and provided with a few small teeth; anterior tibia slightly shorter than the femora, very slightly curved and provided inwardly through entire length with small acute oblique spines; apex of posterior femora not incrassate nor nearly reaching to apex of hemelytra.

Genotype: *Neogorpis neotropicalis* Barber.

Dr. C. J. Drake, to whom I have sent specimens of Porto Rican Tingidæ, has informed me of the following errors: page 6, *Athæa pallidus* is a synonym of *Leptopharsa illudens* Drake. Page 12, *Corythaica moncha* Stal should be *Corythaica planaris* Uhler. Page 13, *Teleonemia proluxa* Stal is *Teleonemia sacchari* Fab. Add to the list of Porto Rican Tingidæ: *Monanthia monotropida* Stal.

1923—Univ. Iowa Stud. in Nat. Hist. 10, No. 3, pp. 24, 25.

In comparing *Dysdercus howardi* Ballou with *ruficollis* Linn., I find that I was in error as to the identity of Linnaeus' species.

D. howardi is a little larger than *D. ruficollis* and considerably wider with the lateral margins of the pronotum expanded and considerably reflexed throughout. The head, anterior lobe of pronotum, except the collar which is whitish, lateral margins and legs reddish. Posterior lobe, except the disk posteriorly, lateral margins and the corium ochraceous. The pronotum is one-third wider than it is long, with the posterior lobe three times as long as the anterior lobe, exclusive of the collar. The antennæ and rostrum are broken off. Page 18, line 4. Change *Corecoris* to *Corecoris*.

1923 — Guide to the Insects of Connecticut, Hemiptera-Lygæidæ: p. 723, line 11, and p. 724, line 34: *Myodochus* Latr. should read *Myodocha* Latr.

ON A FEW NEW AND OLD CHRYSOMELIDÆ

BY CHARLES SCHAEFFER,

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In the list of Chrysomelidæ, which I accepted to furnish for the list of insects of New York State to be published in the near future by Cornell University, appear a few new names necessary on account of misidentifications, which, though known to me for some time, I have neglected to publish so far. In the species of *Donacia* occurring in New York and elsewhere I have been compelled to make quite a number of changes, but these, I hope, will be published in a revision of the North American species of *Donacia* sooner than the list will appear.

***Phytodecta pallida*, Linn.**

This is supposed to be the common species of the genus with quite a wide distribution, but is certainly not identical with the European species.

Kirby, 1837, first recorded the species from Canada as the European *rufipes*. Crotch, 1873, rejects this identification and says that it is the same as the European *pallida* and also places *simplex* Suffr., as synonym of the former.

Comparing our insect with the descriptions and specimens of the European *pallida*, kindly sent me by Mr. Julius Weise of Germany, made it quite clear that the two are different species. Our American insect is a true *Phytodecta*, while the European *pallida* belongs in the subgenus *Spartophila*, and besides other differences the latter species has the elytral punctures coarser and the sixth and seventh outer striæ confused about the middle, in our American insect the punctures are much finer and all the rows regular.

Mr. Howard Notman gave an interesting note in Bulletin Brooklyn Entomological Society, p. 75, on collecting two apparently different species of *Phytodecta*. One, which he identified as *affinis* (*arctica*) he took only on willow, the other which he called *pallida* occurred only on poplar. These latter specimens were smaller and generally less heavily marked especially on the pro-

thorax, and extracting the genitalia of the male of each he found them to be entirely different. Mr. Notman kindly loaned me his specimens of both as well as the genitalia and I have tried to find a good external structural character to support the great difference in the genitalia. In this I did not succeed, but there is a difference in the two in regard to the coloration of the head. In the larger specimens, which he called *affinis* (*arctica*) the head is always bi-colored, that is the posterior part is black and the anterior part reddish, even in specimens in which the thoracic and elytral maculations are largely confluent. In the smaller specimens, his *pallida*, where the elytral and especially the thoracic maculation is smaller, the head is entirely black with occasionally a more or less distinct reddish spot between the eyes on each side of middle. Both are not *arctica* nor *pallida*.

Phytodecta americana, new species.

Phytodecta rufipes, Kirby, Fauna Bor. Am., p. 213.

Chrysomela rufipes, Rogers, Proc. Acad. Nat. Sc., Phil., vol. VIII, p. 35.

Gonioctena pallida, Crotch, Proc. Acad. Nat. Sc., Phil., vol. XXV, p. 52.

Phytodecta affinis (*arctica*), Notman, Bull. Brookl. Ent. Soc., vol. XVI, p. 75.

Reddish yellow, including legs and antennæ; head above, two large triangular basal spots, generally largely confluent basally, scutellum and five large spots, two subbasal, one laterally at about middle and two subapical, black, the elytral spots often more or less confluent or elytra black with basal, sutural, apical and lateral margins reddish; body beneath black, the last or the two last ventral segments more or less reddish yellow. Head sparsely punctate, punctures slightly smaller at middle; third joint of antennæ not as long as the next two. Prothorax strongly transverse, about twice as wide at base as long at middle; sides feebly arcuate; basal angles rectangular, acute, anterior angles broadly rounded; surface sparsely and finely punctate, with a few much larger punctures intermixed, the punctures laterally still coarser. Elytra slightly wider behind middle; punctures of the regular rows moderate; intervals finely and rather sparsely punctate. Ventral segments sparsely punctate, punctures moderately coarse. All the tibiæ with a distinct tooth near apex, the tooth of front tibiæ generally not as large as those on middle and hind tibiæ. Length 5.5-6 mm.

Type from ³Keene Valley, Essex Co., N. Y. (Notman). Other specimens seen are from Rockaway Beach, Long Island (Schott); Derrick City, Pa. (Davis); Duluth, Minn.; Prince Edward Co.,

Type 457 Paratype
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Ont.; Medicine Hat, Alberta (Carr). Two paratypes are in Mr. Notman's collection.

This species is very close to the European *rufipes* and except for slightly smaller size and the elytral intervals sparsely punctate it scarcely seems to differ otherwise.

Phytodecta notmani, new species.

Phytodecta pallida, Notman, Bull. Brookl. Ent. Soc., vol. XVI, p. 75.

Very much like *americana* in form, coloration, and sculpture of prothorax and elytra except being slightly smaller, the black spots on the prothorax small, never triangular, about the size of the scutellum, but less elongate and the head is black with often a more or less distinct reddish spot on each side of middle between the eyes. Length 5-5.5 mm.

Keene Valley, Essex Co., N. Y., collected by Mr. Howard Notman, to whom I am indebted for specimens; two paratypes are in Mr. Notman's collection.

The North American species of *Phytodecta* may be readily identified by the following table:

1. Third antennal joint as long or longer than the two following joints; femora black, tibiæ bicolored.....**arctica** Mann.
Third antennal joint shorter, not as long as the two following joints, legs black or entirely pale.....2
2. Legs black, intervals of elytra rather closely punctate, outer joints of antennæ black.....**viminalis** Linn.
Legs and antennæ unicolorous pale; intervals of elytra sparsely and finely punctate.....3
3. Thoracic spots large, generally triangular and very often transversely confluent; head bicolored, anterior part pale, posteriorly black**americana** Schffr.
Thoracic spots small more or less subquadrate, never triangular, about as large or smaller than the scutellum; head black, occasionally with a more or less distinct, small, pale spot on each side above the antennal insertion.....**notmani** Schffr.

Phytodecta arctica Mann. has been compared at various times with the European *nivosa*, *linnaeana*, *triandrae*, and *affinis*. If it is the same or a variety of any of these remains to be confirmed by a close study of specimens of all these species. The European *viminalis* is once recorded from Alaska but to my knowledge there is no other record nor are there apparently any North American specimens in our collections. *Phytodecta simplex* is described

from North America by Suffrian as "testacea, antennis apice nigricantibus, elytris profunde punctatostratis, tibiis anticis muticis, mediis fortiter calcaratis." I have not seen anything that agrees with this. If Suffrian's specimen came really from North America then it is the only one of our species which belong in the subgenus *Spartophila* and apparently closely allied to *pallida*.

***Disonycha davisi*, new species.**

Similar to *caroliniana* but slightly stouter and shorter with less oval elytra and femora more or less distinctly infusate. Head with a few coarse punctures near each eye which extend nearly to the middle; frontal tubercles well limited below; antennal joints short and rather stout. Prothorax strongly transverse; basal angles distinct but obtuse; anterior angles oblique; surface distinctly punctate. Elytra at base not wider than the thorax at base; sides feebly arcuate; surface distinctly punctate with moderately large punctures. Ventral segments of abdomen moderately closely punctate. Length 5.25-6.75 mm.

Anglesea, N. J., June (type); New Brunswick, Vineland and Lahaway, N. J.; Wyandanch and Yaphank (Davis), Long Island, N. Y.; Kansas; Onah, Manitoba (Wallis).

Type USNM
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I have compared this species with the more common *caroliniana* but it agrees in form, antennal structure, thoracic and elytral punctuation much better with *arizonæ*. This latter, however, has the abdominal segments very sparsely punctate.

This is very likely one of the forms or species included by Dr. Horn under his *crenicollis*, which latter, as I have suggested in Journal New York Entomological Society, Vol. XXVII, p. 334, is not that species but *fumata* Lec. I have since seen Dr. Le Conte's type and my surmise of the wrong identification of *fumata* proved to be correct.

The infusate femora are by no means constant, in some specimens the hind femora at least are reddish, but then generally the two anterior pair are more or less clouded. One specimen has all the femora dark. The marginal vitta of elytra in all my specimens attains the sutural vitta.

***Disonycha asteris*, new species.**

Above flavous, head posteriorly, labrum, antennæ, spots on prothorax, scutellum, a sutural, discal and marginal vitta black, the latter attaining the sutural vitta; body below black except prothorax, two or three of the

apical segments of abdomen and femora, which are reddish or flavous. Head smooth at middle a few coarse punctures near each eye; tubercles divided by a moderately deep impression. Antennæ reaching to about middle of elytra; joints rather elongate and somewhat stout, similar to those of the common eastern form of *quinquevittata*. Prothorax about twice as wide as long; sides feebly arcuately narrowing to apex; basal angles obtuse, blunt; anterior angles oblique; surface alutaceous, finely and sparsely punctate. Elytra at base not wider than thorax at base; sides feebly rounded; surface finely punctate. Body below alutaceous; abdominal segments moderately closely and somewhat finely punctate. Length 6.7 mm.

²Stonewall (type), Aweme, Winnipeg, Manitoba (J. B. Wallis); ²Edmonton and Medicine Hat, Alberta (F. S. Carr).

Two paratypes from Stonewall are in the collection of Mr. Wallis, who sent me the first specimens quite some time ago. These specimens were taken on white aster in a swamp, according to the label on the specimens.

This will be readily known from all vittate *Disonycha*'s with closely punctate ventral segments by the first two, three or four dark ventral segments except *latifrons* from Arizona and Colorado, which has the frontal tubercles of the head flat, even with the rest of the surface and only indicated by finely impressed lines and the elytral vittæ are generally also narrower. *D. fumata* Lec. (*crenicollis* Horn not Say) has also the ventral segments occasionally slightly infuscated, but in this species the femora are generally more or less fumate, the frontal tubercles are much more prominent and the antennal joints are much narrower and more elongate. Although they occur in widely separated localities, both *asteris* and *latifrons* are very close and do not differ very much from each other.

***Haltica betulæ*, new species.**

Slightly shorter and a little more convex than *carinata* Germ. (*ulmi* Woods), color green metallic; prothorax and elytra finely alutaceous, feebly shining. Antennæ about half the length of the body or slightly longer, black with a feeble greenish tint, third joint slightly shorter than fourth, tenth joint slightly shorter than twice longer than wide. Head smooth above; eyes rather small, not as wide as half the space between the eyes; tubercles limited above by a distinctly impressed line, above which are sometimes a few punctures; near the eyes an area of somewhat large punctures. Prothorax a little wider at base than long; sides

parallel from slightly above middle to base, anteriorly slightly narrowing towards apical angles; surface rather indistinctly alutaceous, feebly shining and very feebly punctate, ante-basal groove deeply impressed and entire. Elytra slightly wider than the prothorax at base, distinctly alutaceous and generally duller than the prothorax, finely and rather sparsely punctate, to punctures more indistinct or absent towards apex. Body beneath and legs with greenish metallic lustre; elytral epipleuræ terminating at or slightly beyond the apex of the second ventral segment. Length 3-3.75 mm.; width about 1.5-2 mm.

Olivera, Catskill Mts., N. Y.

A small number of specimens were taken at the above locality on June 18 and 21 on the leaves of birch by Mr. Ernest Shoemaker, in which collection is also a paratype. He informs me that they were very numerous on the leaves of birch but collected only a small number.

This species is readily known from all our species by its short elytral epipleuræ. In all our *Haltica*'s, as far as I know them, the elytral epipleuræ terminate at the apex of the fourth ventral segment, while in *betulæ* the epipleuræ terminate at the apex of the second ventral segment, in only two of the twenty-five specimens examined it extends almost to the third segment. *H. woodsi*, another green species, is a little smaller, with the elytra more shining, more coarsely punctate and the lateral margin of prothorax near apical angles slightly more incrassate and oblique.

Haltica ignita, Ill.

Until recently no small *Haltica* was known that did agree with the description of *ignita*, that is in regard to the possession of a lateral elytral plica. Mr. Fall in *Psyche*, vol. XXVII, p. 106, calls attention to three specimens received from Dr. Chittenden of which the female has, as he says, "a tolerable well defined lateral elytral plica," and further on says that it might serve very well for the type of Illiger's description. For a number of years I have had five specimens of possibly the same thing, males and females, which I had labelled *ignita*. Two were labelled "N. Y.", two from Pine Island, N. Y., and one West Point, N. Y. They all show a more or less distinct lateral elytral plica in both sexes, which is always more strongly defined towards its apex than at middle and towards base, where it is faint or absent. In the list

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of Chrysomelidæ above referred to these are listed as *H. ignita* Ill. and I do not see any reason to do otherwise as they agree very well with the description. Some of the specimens have the head, prothorax and underside with a metallic green or greenish-blue tint. In addition to the above localities I have seen specimens from South Carolina and Alabama, which are in Mr. Liebeck's collection.

***Haltica liebecki*, new species.**

Form of *californica*, color bluish purple to reddish; scutellum more or less distinctly metallic green; antennæ black with a slight brassy tint. Head smooth, very finely alutaceous and feebly shining; eyes, as seen from the front a little smaller than half the space between the eyes. Prothorax slightly wider at base than long at middle, sides feebly narrowing towards apex and narrowly reflexed; surface finely punctate with a few coarse punctures in a short oblique space near the apical angles; ante-basal impression entire or nearly so, finely impressed at middle, more deeply at sides. Elytra oval, at middle less than twice as wide as the prothorax at base; surface finely not closely punctate, the punctures generally a little larger than those on prothorax, intermixed finer punctuation scarcely evident. Body beneath alutaceous, of the same color as above, but occasionally more bluish or even greenish. Last ventral segment of male with a deep and relatively wide median impression at apical half. Length 4-4.5 mm.

³ Huachuca Mts., Arizona.

This species is closely allied to *californica* in form but has shorter and stouter antennal joints. I had placed *liebecki* for a time doubtfully as *vicaria*, but specimens of the latter species kindly sent me by Mr. Liebeck differ in being of more elongate form with less oval elytra.

***Haltica cuprascens* Blatchley**

Through Mr. Blatchley's kindness I have seen the type and one of the co-types of *cuprascens* and according to these it is not what Mr. Fall in *Psyche*, Vol. XXVII, p. 103, identifies as that species, but is apparently what he describes on p. 108 as *H. purpurea*. His description of the latter species at least agrees very well with the types of *cuprascens*. The *cuprascens* of Mr. Fall is what Dr. Woods in his paper on the Maine *Haltica*'s records wrongly as *torquata* and for which later on Malloch proposed the name *sylvia*, which name will stand for this species.

Haltica evicta shoemakeri, new variety.

Differs from typical *evicta* in having the elytra dull and more finely punctate. Length 4 mm.

Plattsburg, N. Y. (type); Catskill Mts., N. Y.; Stephenville, Bay St. George, Newfoundland (Engelhardt); Frankonia, N. H.; Illinois.

Type
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The New York specimens were collected by Mr. Shoemaker and that from the Catskill Mts., a paratype, is in his collection. The two specimens from New Hampshire and Illinois are in Mr. Liebeck's collection.

This is apparently the extreme eastern form of the typical western *evicta*. My twelve specimens of the typical insect, which are from British Columbia, Oregon and Washington, are all shining and more coarsely punctate.

Chalcoides helxines violacea, Melsh.

These are the purple or bluish-red specimens, which also have the posterior femora in great part or entirely dark. The form is apparently a little more robust than in the typical insect and the ante-basal groove of prothorax is frequently less deeply impressed. I am also under the impression that this form feeds on a different plant than the typical form. In view of all this I think it is entitled to recognition.

THE GENUS *MECHANITIS* FABR.,
(LEPIDOPTERA, ITHOMIINÆ)

By W. T. M. FORBES,

DEPARTMENT OF ENTOMOLOGY, CORNELL UNIVERSITY

The Cornell Entomological Expedition of 1919-1920 obtained an exceptionally good representation of this genus, which has been supplemented by material already in the University Collection, several species from the Schaus collection, through the kindness of Mr. Schaus, and material purchased from W. F. H. Rosenberg and Staudinger and Bang-Haas. Altogether, most of the recognized forms of *Mechanitis* are at hand. The collections of the United States National Museum, the American Museum of Natural History, and the Carnegie Museum, at Pittsburgh, have also been consulted, and have given opportunity to see a few more forms, and have demonstrated the range of variation with long series from various parts of South America.

There has never been a systematic study of the species and forms of *Mechanitis*, and no attempt at a key, nor examination of the structural characters. In the only revision of the genus, by Haensch in Seitz's "Macrolepidoptera of the World," the forms are not even divided into natural groups.

Mechanitis is one of a little group of genera of Ithomiinæ characterized in the male by the rudimentary fore tarsi, apparently four-branched (or even five-branched) Cu in the fore wing, Sc and R of hind wing closely parallel at the base, and lobed costa of the hind wing. In the female the same group is unique among the butterflies in having Sc and R not merely closely parallel, but actually fused, out to the middle of the cell; and Cu is apparently four-branched, as in the male. The three genera may be separated as follows:

Mechanitis: Male fore femur full as long as coxa, its tip normally lying in the groove between eye and thorax, or at most a little below the eye; cell of hind wing normally about three-fourths length of wing, with the discocellular markedly angled and transverse; female with Sc arising from cell near its middle, and spur of media attached to lower discocellular in fore wing.

Scada: Fore femur shorter than coxa, the tip when folded lying far below the eye; cell of hind wing two-thirds as long as wing, the discocellular erect and straight or moderately angled, and the upper long and longitudinal; female with Sc arising from cell near middle, and spur of media attached to middle discocellular or opposite M_2 . Small translucent species.

Sais: Fore femur as in *Scada*; cell with its apex reaching almost to margin, and obliquely cut off at end, mdcv. and ldcv. continuing the general line of Cu, and udcv. very short; female with Sc arising from cell near its apex, and cell shaped about as in male.

Heteroscada is synonymous with *Scada*, being based on males of *Scada* and females of *Episcada*.

On genitalic characters only two species can be separated from the general mass of the genus, *M. equicola* and *M. truncata*. I suspect *M. proceris* may also be structurally distinct, but have only a specimen without an abdomen. It is hardly conceivable that all the other forms are a single species, especially as frequently two or three are found in a single locality without intergrading, so I have grouped them as ten species in the following list, recognizing that the number may be reduced still more when the biology is known:

1. *equicola* Cr., with var. *equicoloides*.
2. *truncata* Btl., with varieties *juntana*, *olivencia* and *huallaga*.
3. *proceris* Weym.
4. *polymnia* L., with varieties *chimborazona*, *caucaensis* and *casabranca*.
5. *mazæus* Hew., with vars. *nigroapicalis*, *jurimaguensis*, *phasianita*, *lucifera*, *pannifera*, *fallax*, *messenoides* and *deceptus*.
6. *eurydice* Stgr., with var. *doryssides*.
7. *doryssus* Bts., with vars. *veritabilis*, *labotas*, *utenaia* and *saturata*.
8. *macrinus* Hew.
9. *lycidice* Bts., with var. *isthmia* and ab. *arcana*.
10. *franisi* Hew., with var. *menapis*.
11. *mantineus* Hew., with an undescribed variety.
12. *elisa* Guer., with var. *ocona* and ab. *meneclis*.

13. *lysimmia* F., with vars. *nessaea*, *sulphurescens* and *albescens*.

I have a suspicion in particular that *polymnia*, *mazæus*, *dorysus* and *eurydice* are all one species, but the presence of *eurydice* in the same region with forms of *mazæus* makes a difficulty unless there is Mendelian inheritance. *M. lysimmia* appears to come closer to *elisa*, although Bates thought he had transitions to *polymnia*, and *M. macrinus* perhaps points more nearly to *lycidice*; *franis* and *mantineus* represent each other, and the specimen described below is perhaps an intermediate.

SUMMARY OF FORMS HERE RECOGNIZED AS SPECIES.

(Aberrant specimens are not allowed for in this table)

- A. Separate or nearly separate black postmedial bars on M_3 and Cu_1 ; R and M_1 of hind wing closely approximate in male (stalked in female?).
- B. Two costal spots on hind wing.....**equicola**
- BB. Without two costal spots on hind wing.
- C. Border of hind wing linear.....**truncata**
- CC. Border of hind wing of large black triangles containing white spots **proceris**
- AA. A black comma mark in cell M_3 , or the cell filled with black; R and M_1 of hind wing in male widely separated, in female not stalked.
- B. Postmedial pale spot in cell M_1 of fore wing transverse, frequently absent.
- C. Base of cell Cu_1 heavily black.....**elisa**
- CC. Base of cell Cu_1 of the pale ground color.....**lysimmia**
- BB. Postmedial pale spot in cell M_1 longitudinal, rarely if ever absent.
- C. Smaller, with somewhat translucent wings; red submarginal stripe of hind wing narrow and of almost even width.
- D. Ground normally yellow and heavily marked with black..
mantineus
- DD. Ground tawny at least over median area and more lightly marked with black toward base.....**franis**
- CC. Larger with opaque wings, median black band straighter, leaving a subterminal tawny area which is widest at the middle.
- D. Medial pale area and postmedial markings broadly connected.
- E. Black spot at lower angle of cell smaller than the one at upper**polymnia**

- EE. Black spot at lower angle of cell larger than the one at upper; base of wings frequently black...**mazaëus**
- DD. Postmedial band separated by black markings from the medial tawny area; lower spot at end of cell when recognizable larger than upper.
- E. Yellow postmedial spot in cell M_1 widely separated from the radial vein; black spot in base of cell Cu_1 small or absent**macrinus**
- EE. Postmedial spot in cell M_1 resting on the vein, and in contact with the postmedial costal spot; a large black triangle in base of cell Cu_1 .
- F. End of comma-mark connected to inner margin, cutting off a tawny anal spot from the yellow postmedial area**lycidice**
- FF. Ground color in cell Cu_2 continuous to anal angle, and without a sharp change in color.
- G. Outer end of postmedial yellow bar occupying the center of cell M_3 **doryssus**
- GG. Outer end of postmedial yellow bar occupying the lower part of cell M_3**eurydice**

Key to Forms

1. Hind wing with two large black subcostal spots, at middle and end of cell, sometimes obscure above in male (*equicola*).....2
1. Hind wing without two separate costal spots.....3
2. Hind wing with two separate series of spots on the disc.....
***e. equicoloides**
2. Discal and marginal bands partly fused into a patch.....
equicola (sylvanoides)
3. Fore wing with a black streak centering on outer part of Cu_1 , sometimes partly fused with a similar shorter streak on Cu_2 , forming a sort of comma-mark, which crosses both veins broadly....4
3. Fore wing without streaks centering on M_3 and Cu_1 , the space between these veins commonly filled with black, or with a comma-mark completely enclosed between these veins, female with R and M_1 not stalked.....7
4. Under side with conspicuous white marginal spots in black triangles on both wings; fore wing with only one rounded spot in middle of cell, and a faint dark shade toward base; upper side of fore wing largely yellow.....***proceris**
4. Under side with a linear black border, not containing white spots on hind wing; fore wing with a triangular spot in base of cell as

*Species marked with an asterisk are in the collection of Cornell University or my own collection.

- well as the spot at the middle, at least on under side; upper side usually with only a yellow postmedial band; female with R and M_1 stalked (*truncata*)5
5. Fore wing with a yellow postmedial fascia6
5. Fore wing with a yellow discal spot only.....**t. olivencia**
5. Ground of fore wing wholly brown or tawny.....***t huallaga**
6. Ground of fore wing deep red-brown, with heavy black markings***t. truncata**
6. Ground tawny, with light black markings.....***t. juntana**
7. Fore wing with the tawny or yellow postmedial fascia broadly connected with the tawny base.....8
7. Fore wing with postmedial light band or spots completely separated from the reddish (or yellow) base by a black fascia (sometimes with a yellow median band across the cell, or with the apex wholly black)19
8. Hind wing normally with a narrow median band; fore wing with upper spot at end of cell larger than lower, or with the band at end of cell broader at costa.....9
8. Hind wing almost always with a very broad median band, often fused with the black border; fore wing almost always with lower spot at end of cell larger than upper, or with a bar broader at the lower end (*mazacus*).....**13**
9. Fore wing typically with two separate spots at end of cell; black spot in base of cell M_3 very small, much wider than long (*polymnia*)10
9. Fore wing with a single bar across end of cell; spot in base of cell M_3 much longer than wide.....***doryssus** (light specimens)
10. Under side of hind wing in both sexes, and upper side in female without a black postmedial band, the band above very broad in the male; postmedial yellow band of fore wing much narrowed toward inner margin (Ecuador).....***p. chimborazona**
10. Hind wing with black medial band about alike in both sexes and as strong below as above; yellow band of fore wing about as broad at outer margin as near end of cell.....11
11. Ground dark red-brown, the apical streak very strong and contrasting; spot in cell normally triangular.....***p. caucaensis**
11. Ground tawny; subapical spot smaller, spot in cell rarely triangular12
12. Subapical streak distinct, at least below; hind wing without yellow fascia***p. polymnia**
12. Subapical streak absent; hind wing with a yellow stripe in cell***p. casabranca**
13. Fore wing with ground tawny to base, at least in cell.....14
13. Fore wing with base solidly black, or at most with slight red-brown streaks; hind wing all black except apex.....17

14. Hind wing with separate black postmedial and margin bands....15
14. Hind wing black, with a red stripe in cell and apical patch only16
15. Fore wing with apex solid black.....**m. nigroapicalis*
15. Fore wing with a narrow and sharply defined red-brown band in apex**m. mazæus*
15. Fore wing with a larger diffuse tawny subapical area, more or less shaded with yellow, and sometimes connecting below with the tawny median area, which also has some yellow scaling.....
**m. jurimaguensis*
15. Apical portion of fore wing suffused with red-brown.....
m. phasianita
15. Fore wing with postmedial band yellow and apical region marked with yellow†*m. lucifera*
16. Fore wing with apex solid black†*m. pannifera*
16. A yellow spot in apical region..... †*m. fallax* (?)
17. Two yellow submarginal spots, in cells M_3 and Cu_1 of fore wing*m. meterus*‡
17. Outer margin without pale spots.....18
18. Fore wing with a yellow postmedial fascia.....†*m. messenoides*
18. Fore wing all black and red.....**m. deceptus*
19. Fore wing light yellow along base of Cu , with red showing as a spot at anal angle only; hind wing with a narrow red submarginal band**mantineus*
19. Fore wing with base deep ochre or darker, the base of Cu not paler than the region at the anal angle.....20
20. Fore wing as a rule with a zigzag postmedial fascia, in any case with the yellow postmedial area in cell M_1 a longitudinal oblong, and that in M_2 , when present, much shorter and transverse; antenna mostly yellow21
20. Fore wing with an obliquely transverse pale postmedial fascia in cell M_1 , frequently continuous with a similar one in cell M_2 , or else wholly black postmedially, never with a zigzag postmedial fascia33
21. Spot in cell M_1 small, widely separate from the costal postmedial spot when that is present, and well separated from the stem of R ; no postmedial yellow spot in cell M_2**macrinus*
21. Spot in cell M_1 in contact with that on the costa, being separated only by the black vein, almost always with a transverse spot in cell M_2 also22

‡I have entered this species where it would run in the key. I very much doubt if it is a *Mechanitis*.

†Species marked with a dagger have been examined in American collections.

22. A small rounded black spot in base of cell Cu_1 or none; hind wing with broad and subequal postmedial and marginal black bands, with a narrow and even red stripe between them, or with outer part of wing wholly black (*franisi*).....23
22. A large triangular black area in base of cell Cu_1 , usually leaving a squarish yellow or more rarely reddish spot in the middle of that cell; hind wing normally with black border slender, preceded by a reddish area which is broadest at the middle.....24
23. Hind wing with separate discal and marginal black bands.*f. *franisi*
23. Hind wing with outer half solid black.....*f. *menapis*
24. Marginal and postmedial light areas in cell Cu_2 separated by a complete black bar, extending down from the comma-mark or from the black filling of the outer part of cell Cu_1 to the black inner margin, rarely with vein Cu_2 narrowly red; border of hind wing even and commonly linear, in the male a third as wide as the discal band, which is often obsolete in the female; antenna mainly black (*lycidice*)25
24. Marginal and submarginal spots in cell Cu_2 broadly connected, normally both tawny; comma-mark distinct, connected to the black postmedial band but not to the inner margin; median fascia on hind wing about as broad as the black margin and alike in both sexes, the border often of white-centered black triangles.....27
25. Ground darker; postmedial band broken into spots; band below lower angle of cell often of two separate spots, or with the lower spot (below Cu_2) lost; band of hind wing of male commonly entering cell; female with apical region of fore wing two-thirds black, and a third or less yellow.....*l. *isthmia*
25. Ground paler; postmedial band of both sexes complete; spot at lower angle of cell large, complete, crossing Cu_2 ; band of hind wing not entering cell; female with apical half of fore wing nearly half yellow*l. *lycidice*, 26
26. Cell of hind wing of male with a little yellow, of female all tawnytypical form
26. Cell of male wholly yellow, of female with considerable yellow....
form *arcana*
27. Male antenna with only apical third yellow; fore wing beneath with outer end of the yellow postmedial band pointing directly at the white terminal spot, or bifurcated and almost enclosing it; inner edge of black bar at end of cell waved. Fascia on middle of hind wing above slightly widened in male only....**doryssus veritabilis*
27. Male antenna mainly yellow, with basal third black.....28
28. Outer end of yellow postmedial band beneath pointing directly toward the white marginal spot, or bifurcate and almost enclosing it, when narrowed occupying upper part of cell; inner edge of the bar at end of cell oblique and nearly straight, border of hind wing

- normally nearly even. Male with fore wing less than four-tenths as wide as long (*doryssus*).....29
28. Outer end of postmedial band pointing decidedly below the white marginal spot, the band when narrow occupying the lower part of the cell; inner margin of cell-bar irregular or sinuous. Male with fore wing more than four-tenths as wide as long (*eurydice*)....32
29. Ground deep ochre yellow, only apex of black discal band of hind wing preserved ♀ form ***labotas**
29. Median band of hind wing practically complete.....30
30. Median band interrupted at the middle (Honduras).....**d. utenaia**
30. Median band complete, continuous (Guatemala to Costa Rica)..31
31. Postmedial yellow band of fore wing very narrow, normally less than half as wide as the dark ones before and beyond it; ground dark tawny***d. saturata**
31. Postmedial band and light markings generally, broader; ground lighter tawny***d. doryssus**
32. Fore wing with the pale spot in middle of cell Cu_1 yellow; hind wing with a strong yellow band in cell of male, and with some yellow in female.....***e. eurydice**
32. Fore wing with the quadrate light area in middle of cell Cu_1 largely or wholly tawny; hind wing without any yellow; ground darker brick red***e. doryssides**
33. Base of cell Cu_1 of fore wing wholly yellow or rarely with a small black dot; subapical pale spot broad and rounded (*lysinnia*)....34
33. A large triangular black patch filling the base of cell Cu_1 of fore wing, or cell Cu_1 mostly black with a yellow spot only (*elisa*)..37
34. Subapical spot yellow35
34. Subapical spot white36
35. With postmedial yellow dots at costa and inner margin..***l. nessæa**
35. No postmedial spots**l. sulphurescens**
36. Under side with a second irregular white submarginal spot below the subapical spot, the lower half of it showing on the upper surface also***l. albescens**
36. No such spot; the subapical spot occasionally edged on the inner side with a complete white band..... **l. lysinnia**
37. Fore wing with spot in cell Cu_1 overflowing into cell Cu_2 ; typically with an oblong postmedial band or bar between the costal and dorsal spots; and cell-spot crossing R.....***e. ocona**, 38
37. Yellow spot in cell Cu_1 crescentic or rounded, not crossing Cu_2 , cell-spot not crossing R; postmedial spots at costa and at inner margin only***e. elisa**
38. Yellow spots small, the one in cell Cu_1 accompanied by a separate satellite below Cu_2 ; hind wing without a median band above, with separate spots below**ab. *meneclis**
38. Yellow spots large, and spots in cells Cu_1 and Cu_2 broadly continuous; hind wing with a postmedial band.....***typical form**

NOTES

M. equicola (Cr.) Cramer's original figure of *Papilio equicola* shows plainly the single white marginal spots of a *Mechanitis*, not the double spots of a *Melinæa*, and also the characteristic broad zigzag yellow postmedial band and the two costal spots on the hind wing, of *equicoloides*. The postmedial and marginal black areas are almost completely fused on the hind wing, and so *sylvanoides* Godman and Salvin becomes a synonym. *Equicoloides* is a variant form, but perhaps worth a name. The male genitalia are characteristic, lacking the emargination at the apex of the valve, which is well-marked in *truncata* as well as the remaining species.

M. truncata Btl. This is also a well-marked species, both on pattern and genitalic characters. The truncation of the hind wing cited as the best specific character is confined to the male, and is difficult to appreciate, as in the typical group the hind wing is only a little less truncate. A better character may exist in the venation: in the female of *M. truncata* R and M_1 of the hind wing are strongly stalked, and in the male they are approximate at the origin and strongly curved; in the females of the *polymnia* group R and M_1 are separate or barely stalked while in the male they are well separated and only moderately curved. Males of *M. equicola* and *M. proceris* agree with *truncata*, but I have not seen females. In *truncata* also M_1 is stalked in the fore wing almost out to the origin of R_2 from the radial stem, in the *polymnia* group, it frequently is free, but the amount of variation is extraordinary. *M. truncata* differs from all the other species, apparently even from *M. proceris*, in the presence of two well-marked black spots in the cell of the fore wing, at least on the under side. The more basal one is triangular, the outer, which represents the spot present in other species, nearly round. The *polymnia* group are also separable by the black postmedial mark in cell M_1 being confined between the veins, unless the whole outer part of the wing is black, while in the other three species there are two separate or partially separate black bars centering on the veins. The species breaks into forms parallel to those of the *polymnia* group and easily confused with them. For instance

egaënsis Bates is a form of the *polymnia* group, while his var. B is typical *truncata*. I have received a dark specimen of form *juntana* as *fallax*, but the original description shows that name belongs in the *polymnia* group, and I have placed it doubtfully in the key.

The male genitalia are close to those of *polymnia*, but the gnathos is simple at its junction with the tegumen, and the valves are shorter and broader, with a heavier spur at their tips.

In some of the specimens of *M. t. juntana* in the Carnegie Museum the yellow is extended, almost as in *M. proceris*, but the hind wing pattern is distinctive, one aberration has the yellow replaced with gray.

M. proceris Weymer. This appears to be a good species, with the truncation of the hind wing even more exaggerated than in *M. truncata*. There is a similar form of *truncata* with an extended yellow area on the disc of the fore wing, but the lightly marked hind wing will easily separate it.

M. polymnia (L.). This is the oldest species of the genus, and typical of a large group of forms, which I have treated as six species, though I think there are fewer. For instance, there are specimens intermediate between *caucaënsis* and *veritabilis* in the Carnegie Museum, and others which resemble *veritabilis* save in the yellow antenna, from Venezuela. Bates also speaks of material from Central Brazil connecting *polymnia* with *nessæa*, though I have seen none. *Eurydice* and *doryssus* should perhaps be united even on present knowledge, as they seem to intergrade in Colombia, but *mazæus* also seems to intergrade with *polymnia*, and *mazæus* and *eurydice* certainly appear distinct.

Forms *polymnia*, *casabranca* and *caucaënsis* can hardly be kept separate even as varieties, as they fly together in most places to a greater or less extent, and the best one can say is that a given locality belongs predominantly to one or the other. I would credit typical *polymnia* to the Amazon basin as well as the Guianas.

M. mazæus Hew. The only form that I have taken in numbers is *M. m. deceptus*. I suspect that after all this may be a Mendelian form of *eurydice*, in spite of the striking difference in coloring due to mimicry of *Heliconius*. In light specimens (typical

mazæus) the arrangement of the spots is exactly as in *eurydice*, and they may possibly be hybrids. As things now stand it is best to keep the names separate.

M. eurydice Stgr. Hænsch associates this form with *lycidice* and *isthmia*, an obvious mistake, as it is the southern representative of *doryssus*, differing only in a small point of pattern. I have kept the name distinct, but have seen intermediates from Colombia. The form appears very rare in American collections, but was abundant in the Chanchamayo district, flying with the closely similar *Hirsutis neitha* in many cases, but tending a little more to keep in the shade.

M. jurimaguensis Stgr. This species when described was compared with *truncata*. A specimen received from Staudinger and Bang-Haas, is however a light form of the *mazæus* type and rather close to typical *mazæus*. It may be misdetermined, but the original description is inadequate, and the broad black bands on the hind wing mentioned in the description certainly do not point to a *truncata* form. The female of this form was sent to me as *metera* Hew. This is obviously incorrect, as *meterus* has quite a different wing-form according to the original figure, as well as pale marginal spots. I am almost certain that *meterus* is a *Ceratinia*, and probably a variety of *mansuetus* mimicking the same *Heliconius* group as *M. mazæus deceptus* and *Hyposcada fallax*.

M. macrinus Hew. This form is very close to the *polymnia* series on one side and to *lycidice* on the other. I suspect it is a form of *lycidice*, but as the distributions overlap I keep it separate. I have received a specimen with the yellow median area almost replaced by tawny, determined as *labotas*.

M. lycidice Bts. This form keeps perfectly distinct from the *doryssus* forms occupying the same areas, and is certainly as good a "species" as any in this series. I cannot see how Hænsch mixed it with *eurydice*. The various forms intergrade perfectly and each is highly variable, so that frequently a given specimen could be called by one varietal name as well as another. I have no data on *M. californica*. It is commonly credited to *M. l. isthmia*, which is the species Holland figures to represent the name.

M. mantineus Hew. This is in appearance the most striking perhaps of all the *Mechanitis*es, but in detail of pattern is not unlike the darker forms of the *polymnia* group. The translucency and the arrangement of the pattern on the hind wing point to a connection with *fran*is, and the following form, represented by a single specimen in the U. S. National Museum, is possibly an intermediate. As I should analyse the pattern it leans rather toward *mantineus* than *fran*is.

Antennæ yellow. Ground tawny; fore wing with yellow postmedial fascia very broad, the yellow area in cell M_3 being three times as long as broad, and the rest in proportion, completely cut off from the tawny base. Hind wing with a broad black border with *two* extensions inward in each interspace (unlike all the other *Mechanitis*-forms); postmedian fascia running well beyond cell and leaving a narrow red stripe of even width between itself and the border, much as in normal *mantineus* and *fran*is. Under side with large white marginal spots.

M. franis Reak. The translucent wings as well as the shape of the bands of the hind wing of the typical form connect this species with *M. mantineus*.

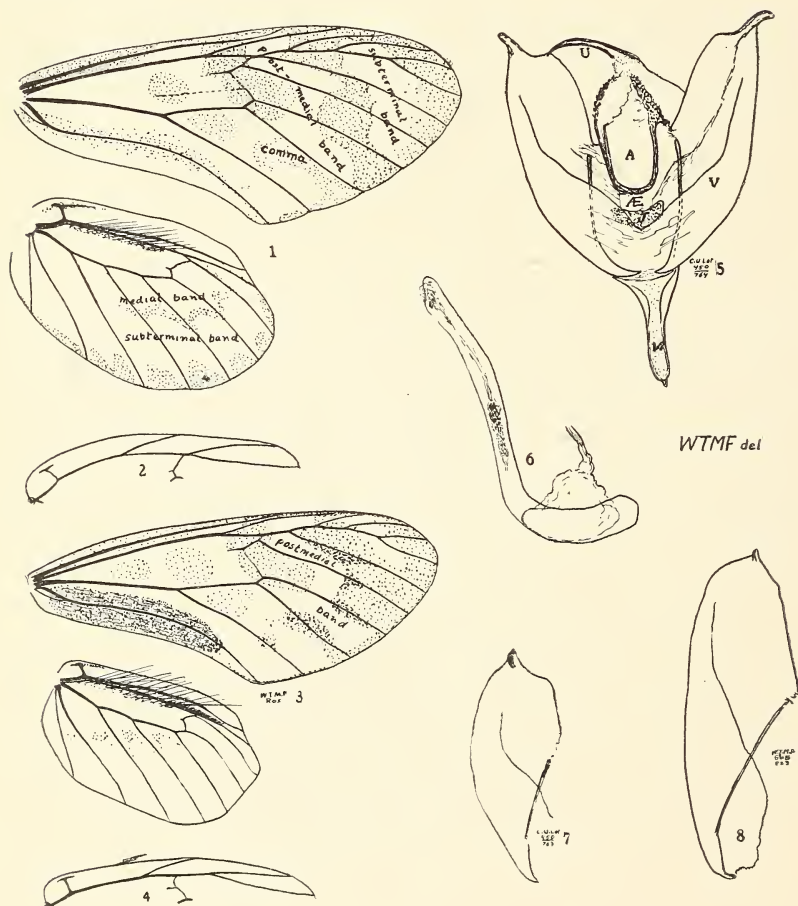
M. elisa Guer. This group of forms certainly seem to represent a species distinct from the *polymnia* series, flying together with *curydice* in Central Peru. I have no specimens as light as Hænsch's figure of *M. ocon*a, but have seen one in the Carnegie Museum from eastern Bolivia; Peruvian specimens certainly represent this form; *menecles* seems to be merely a name for dark specimens, and hardly worth distinguishing. I follow general usage in applying the name *elisa* to the southern race which I have from the provinces of Tucuman and Jujuy, Argentina.

M. lysimnia F. At first sight this species seems to represent *macrinus* in the south, but some specimens show plainly the postmedial band as an irregular series of white spots on the under side. In these specimens the spot in cell M_1 is clearly transverse, connecting the species with *elisa* rather than the *polymnia* group, as Bates imagined. I have seen nothing that by any stretch of imagination could be called an intermediate.

EXPLANATION OF PLATE XII.

1. *Mechanitis doryssus*, transitional to *polymnia*. Venation and pattern of male.
2. *M. eurydice*. Costa of hind wing of female.
3. *M. truncata huallaga*. Venation and pattern of male.
4. *M. truncata*. Costa of hind wing of female.
5. *M. eurydice*. Male genitalia.
 A. Position of anal tube.
 Æ. Position of ædæagus
 J. Juxta
6. Ædæagus of *M. eurydice*.
7. Left valve of *M. truncata juntana*.
8. Left valve of *M. equicola equicoloides*.

U. Uncus
 V. Valve
 Vi. Vinculum



PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF OCTOBER 16, 1923

A regular meeting of the New York Entomological Society was held at 8 P. M. on October 16, 1923, in the American Museum of Natural History. President Harry B. Weiss in the chair with 15 members and five visitors present.

Mr. H. H. Rucker, of College of City of New York,

Dr. Roland F. Hussey, New York University,

Dr. Priscilla Butler Hussey, 32 Waverly Place, N. Y. City,
were elected members of the Society.

Mr. Davis read a paper on "The Orthoptera of Wingina, Virginia, which will later be printed in full. It was discussed by Mr. Olsen, Mr. Weiss, and Mr. J. C. Bridwell, lately of Hawaii.

Mr. Loren B. Smith, of the Japanese Beetle Laboratory at Riverton, N. J., read a paper on *Popillio japonica* which since it was first found by Weiss & Dickerson at Riverton, has spread over an area of from 3500 to 4000 square miles, though its distribution is still irregular. In one peach orchard 15 washtubs full were obtained but elsewhere far less. The life history of the beetle was described including its omnivorous appetite which includes 218 kinds of plants. The remedies and attempts to control it by parasites and bacteriological diseases were also discussed. The cost of the control measures was stated to be \$170,000.

MEETING OF NOVEMBER 6, 1923.

A regular meeting of the New York Entomological Society was held at 8 P. M. on November 6, 1923, in the American Museum of National History. President Harry B. Weiss in the chair with 12 members and five visitors present.

The thanks of the Society were voted to Mr. Davis for his generous donation towards the cost of printing the "Journal".

The President announced the death on October 30 of Mr. Edgar L. Dickerson. Mr. Dickerson died at the Passaic Hospital, following an operation, and was buried at Chester, New Jersey, where he was born January 13, 1878. He had been a member of the Society for more than ten years and regular in his attendance at its meetings, to which he frequently contributed matters of interest.

On motion by Mr. Davis, resolutions of sympathy were ordered to be prepared by a committee to be appointed by the President.

In view of a further increase in the cost of printing the "Journal", the publication committee was requested to submit a report at the meeting of December 4.

Dr. Sturtevant and Mr. H. H. Johnson spoke on "Associations between Flies of the sub-family *Borborinae* and Dung Beetles of the family *Scarabaeidae*", illustrated by specimens of both. The following abstract has been prepared by Mr. Johnson:

The Dipterous sub-family *Copromyzinae* (*Borborinae*) includes the genera *Sphaerocera*, *Leptocera*, and *Copromyza* (*Borborus*), all of them typical dung feeders. *Trichocypsel*a, one of the numerous subgenera of *Leptocera*, contains four Old World species (Spain, Africa, Ceylon) that are always to be found on the ventral surfaces of *Scarabaeus* and other related dung-beetles. *Trichocypsel*a has not been found in America, but we have found similar habits in an undescribed species of a common subgenus (*Borborillus*) of *Copromyza*. This species was observed upon the elytra of dung-beetles rather than upon the ventral surface, and specimens were obtained upon *Phaneus carnifex* on Nonamesset Island, Mass., and upon *P. igneus* and *Canthon laevis* at Crescent, Ga. Like *Trichocypsel*a these flies, conspicuous by their dark bodies and snowy white wings, are apparently not parasites, but probably use the beetle only for transportation ("phoresic species") Unlike *Trichocypsel*a they were found relatively common upon the dung itself even when no beetles of the species affected by them were found to be near. *Copris* and smaller species of *Canthon* were not ridden by the fly; and other *Copromyzines* were not observed to ride beetles.

Mr. Johnson also exhibited specimens of *Drosophila inversa* Walker, taken at Macon, Georgia. The species has previously been recorded from New Jersey, Indiana, Illinois and northward. Mr. Johnson's observations indicate that the larvæ are true parasites on the alder spittle-insect. Other apparently new records for Georgia are *Zacompsia fulva* Coquillett, *Drosophila hydei* Sturtevant, *D. mulleri* Sturtevant, and *D. sigmoides* Loew. An apparently undescribed species of *Canace* (*Ephydrinae*) was found in enormous numbers on *Spartina* grass in salt marshes at Crescent, Ga., where it is locally known as marsh-gnat. This genus is not listed in Aldrich's "Catalogue"; and, while Williston lists it in his "Manual of North American Diptera", a more definite record as to species or locality was not found. A different species of the same genus has been taken by Dr. Sturtevant in Massachusetts.

Mr. Notman spoke on "Collecting Beetles on a Transcontinental Automobile Tour" with illustrations by about 100 photographs and a part of the beetles he had collected. Leaving New York May 2 he had returned to Keene Valley, N. Y., September 23, making fourteen stops of from 1 to 14 days duration, visiting four national parks, and collecting over 10,000 beetles. The stops were made in Michigan, Minnesota, North Dakota, Montana, Idaho, Washington, Utah, Oregon, and Yellowstone Park, whence he drove homeward for three weeks without stops for collecting.

Mr. Notman described each of the places at which he had stopped and mentioned some of the interesting species he had found particularly in the

families *Carabidae* and *Staphylinidae*. He said that in collecting beetles along the river front he had observed no striking differences in the fauna but that the forests west of the Rocky Mountains, presented a different appearance from the preponderance of evergreens.

His remarks were discussed by many of the members, developing that Mr. Notman had captured as well as beetles, cicadas, butterflies, membracids and other insects of interest; and had devoted a part of his time to painting some of the striking scenes in the national parks.

Mr. Davis announced the death at St. Petersburg, Florida, about October 25, of George Franck, long an honored member of the Brooklyn Entomological Society, which formerly met at his home. Mr. Franck had reached an advanced age.

Mr. Davis also showed a newspaper clipping received from Warren Knaus regarding a poisonous spider in Kansas.

MEETING OF NOVEMBER 20, 1923

A regular meeting of the New York Entomological Society was held at 8 P. M. on November 20, 1923, in the American Museum of Natural History. President Harry B. Weiss in the chair with 19 members and seven visitors present.

The following resolutions were adopted:

WHEREAS the New York Entomological Society has learned with deep regret of the untimely death of its member, Mr. Edgar L. Dickerson, therefore be it

RESOLVED that this Society records with deepest regret the loss of one of its most enthusiastic and respected members.

RESOLVED that the members of this Society tender to the family of its late member, an expression of sympathy in their loss and express the hope that the memory of his many virtues will afford consolation in their grief.

RESOLVED that these resolutions be entered on our minutes and a copy forwarded to the family of our late member.

The president read the obituary notice he had prepared for "Entomological News".

Dr. O. A. Johannsen, of Cornell University, was elected a member of the Society.

The Secretary read communications in relation to "Zoological Record" from Dr. E. W. Gudger. On motion by Mr. Davis, subscription by the Society to 10 copies of the *Insecta* portion was authorized for its members.

The Secretary exhibited a separate from *Zoologischen Jahrbuchern*, bd., 47, 1923, containing descriptions by Dr. Walther Horn of *Cicindelidae* with reference to North American species, also at the request of Mr. Mutchler, 112, A Memoria del Directorio Compania Administradora del Guano, Lima, 1921, containing description by Dr. Robert C. Murphy of

Psammotrichus lavalleyi, a new species of Coleoptera from the Guano Islands of Peru, the type of which is in the Brooklyn Museum, also Circular No. 80, Exp. Sta., Porto Rico, being a popular account of El Cucubano.

Mr. Davis exhibited and highly praised Bulletin 36, New Jersey Agricultural Department, Graphic Summary of N. J. Agriculture by Harry B. Weiss.

Dr. Hussey gave a learned "Discussion of Development of Mouth Parts in *Belostoma*", illustrated by lantern slides. After a review of the literature of the subject he showed how in June and July it was possible to obtain plenty of eggs from the back of the male and then trace their development. This Mrs. Hussey and he had done after obtaining about 150 eggs from each of 40 males. The stages of development were shown on the screen from drawings made until the lymph appeared and demonstrated the formation of the four-pointed beak.

Dr. Hussey's paper was discussed by Messrs. Weiss, Notman and Leonard, especially in reference to the dilution of food by injection of saliva of Hemiptera and the consequent effect upon the plants attacked.

Messrs. West and Weiss spoke of "The Plants and Insects of a Dry Woods in the Pine Barrens of New Jersey", illustrated by about 20 boxes of the insects found, topographical map of N. J. and a tabulated chart of the results.

Mr. West first described the area selected, about 20 acres, 14 of forest and 6 of open ground, near Lakehurst, N. J., and the trees, shrubs and herbaceous plants found growing there in a sandy soil, entirely destitute of water courses. Mr. Weiss then showed how carefully the insects had been collected on repeated visits at different seasons and by various methods, sifting, sweeping, beating, and netting, until they were satisfied that a fair sample had been obtained. Final conclusions were reserved until a similar survey of other areas was completed.

Dr. Leonard gave a brief report on the progress made on the New York State List of Insects, to the effect that fifty specialists have volunteered and that the sheets are in progress.

THE COLORS OF BUGS

Two papers by Leroy S. Palmer and Harry H. Knight on the colors of bugs have recently appeared in the "Journal of Biological Chemistry" (Vol. LIX, No. 2, March, 1924, pp. 443-449; pp. 451-455). These authors, after a chemical study, conclude that "the yellow and red colors seen in the hypodermis of the stink-bug, *Perillus bioculatus* (Fab.), are due largely to carotin which is derived from the food; namely, chiefly the lymph of the potato beetle, *Leptinotarsa decemlineata* (Say)," and state that the lymph of the potato beetle is colored entirely by carotin, the concentration in fresh lymph being as high as that found in fresh green leaves. Carotin has been defined as a ruby red crystalline substance found in the chromoplasts in various plants especially the carrot.

The authors made chemical examinations of the red pigment in other bugs and found that it was not limited to one type of substance but that "water soluble pigments appear to be more common than carotin." They report that the vermilion color of the aphid *Tritogenaphis rudbeckiae* (Fitch) is due chiefly to an anthocyanin-like pigment although small amounts of carotin are present. Anthocyanin is a coloring matter found in the cell sap of many plants and is red in the presence of acids. The red color of the red and black plant-bugs *Leptocoris trivittatus* Say, *Lygaeus kalmii* Stal, *Lopidea staphyleae* Kngt., *Coccobaphes sanguinarius* Uhler and the assassin-bug *Eulyes illustris* Stal was found to be due to a flavone-like pigment. Flavone is the parent substance of a large number of yellow dyestuffs.

Palmer and Knight state that it is difficult to "understand how environment can cause a permanent modification of an insect color pattern involving an animal pigment which is derived from the food, and which is subject to fundamental physiological processes of the protoplasm without first causing a permanent modification of the processes to which the derived pigment is subject" and believe that the claim that red pigment in insects can be so changed and the changes become inheritable loses weight in view of the findings that the pigment is likely to be one of the previously mentioned substances derived from the food.

H. B. WEISS.

The New York Entomological Society

Organized June 29, 1892.—Incorporated June 7, 1893.

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Avenue.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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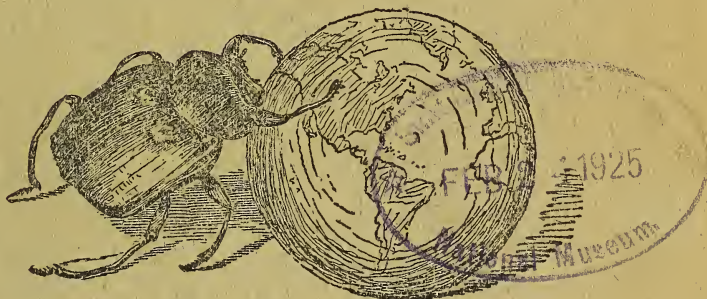
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OF THE
NEW YORK
ENTOMOLOGICAL SOCIETY.

Devoted to Entomology in General.



DECEMBER, 1924

Edited by **HARRY B. WEISS**

Publication Committee.

HOWARD NOTMAN

F. E. LUTZ

J. D. SHERMAN, JR.

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NOTICE: VOLUME XXXII, NUMBER 3 OF THE JOURNAL
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GUSTAV BEYER.

Gustav Beyer, for many years a member of the New York Entomological Society, died on August 23 at his home, 310 Summit Avenue, Mt. Vernon, N. Y. Mr. Beyer was born July 5, 1840, in Wolkenstein, Saxony, and was educated from early youth in the manufacture of furs. He acquired a competence as a manufacturing furrier in New York City and, when he was past forty years of age, began to make a collection of beetles. The late George Franck, who was at the time one of his salesmen, introduced him to the pursuit of insects. For more than twenty-five years he collected with an energy that soon made him the possessor of a remarkable collection. Long trips to the mountains of North Carolina, to the Florida Keys, to Texas, Montana, Arizona, and Lower California, where he remained for nine months, added to his collection long series of species that were new or rare in other collections. During these years his home at 511 East 117th Street was the scene of many entomological gatherings and the hospitality that he and Mrs. Beyer dispensed was unbounded. Coleopterists from far and wide came to know the back parlor with its cabinet drawers filled with duplicates, liberally donated to visitors, the little garden with its collection of cactus, and the basement dining room where good things to eat and coffee were provided, even at three o'clock in the morning. About ten years ago the infirmities of age checked his ardor for a time, but the removal to Mt. Vernon in 1917 proved beneficial and the opportunity of obtaining a large collection of Buprestidæ, accumulated by a German collector, renewed his interest. At eighty years of age he was working daily on this collection; and

until Decoration Day of this year he was able to move about the house and on his eighty-fourth birthday to receive fifty-eight visitors.

Mr. Beyer possessed a remarkably hardy constitution, which enabled him to withstand fatigue, thirst, and the roughest conditions on his collecting trips; and a persistence which kept him going, regardless of obstacles, when rare beetles were to be had. Many new species and one new genus which he had thus discovered were named in his honor. He was a keen lover of nature, as shown by his love of flowers as well as beetles. Above all, he was a wise and kindly man whose passing away will be most lamented by those who knew him best, his own family and the few entomologists of the last century, who still survive.

CHAS. W. LENG.

THE OLFACTORY SENSE OF THE CABBAGE BUTTERFLY.

Mr. Dwight Elmer Minnich, writing in the "Journal of Experimental Zoölogy" (vol. 39, No. 2, pp. 339-356), records the results of his experimental studies with *Pieris rapæ* Linn., and concludes that the antennæ "probably constitute the most important olfactory area, each antennæ being richly equipped with olfactory organs." Mr. Minnich describes his materials and methods in detail. Selecting the extension of the proboscis as the olfactory reaction, he found that when one antenna was eliminated from possible olfactory stimulation by being coated with vaseline or a paraffin-vaseline mixture or by amputation, the olfactory response was reduced very greatly, on the average 58 per cent. Mr. Minnich states that "there were no fundamental changes apparent in the general behavior" of the specimens following the coating of the antennæ and amputations and believes that the decreases of response were due chiefly to the elimination of the olfactory organs and not to an abnormal state of behavior. Ed.

THE MALE GENITALIA OF CUPES CONCOLOR WESTW. (COLEOPTERA).

By F. MUIR.

HONOLULU, T. H.

In the Transactions of the Entomological Society of London, Dr. David Sharp and the present writer described the male genitalia and last abdominal segments of *Cupes clathratus* Motsch* (Japan). The material at our disposal was old and the membranous connections between the segments not at all intact. We described an unique structure which we marked f in our figures and considered it as an internal development of the ninth tergite. Thanks to the kindness of Dr. R. J. Tillyard, I have recently been able to examine a male of the American *Cupes concolor* Westw. and find that the above mentioned structure which we left unidentified is plainly the ninth sternite. Although there are small specific differences between the genitalia of the American and Japanese species, in all essential features they are similar, showing that a very close relationship exists between these two northern species. It is to be hoped that the male genitalia of the Australian species will shortly be described and figured.

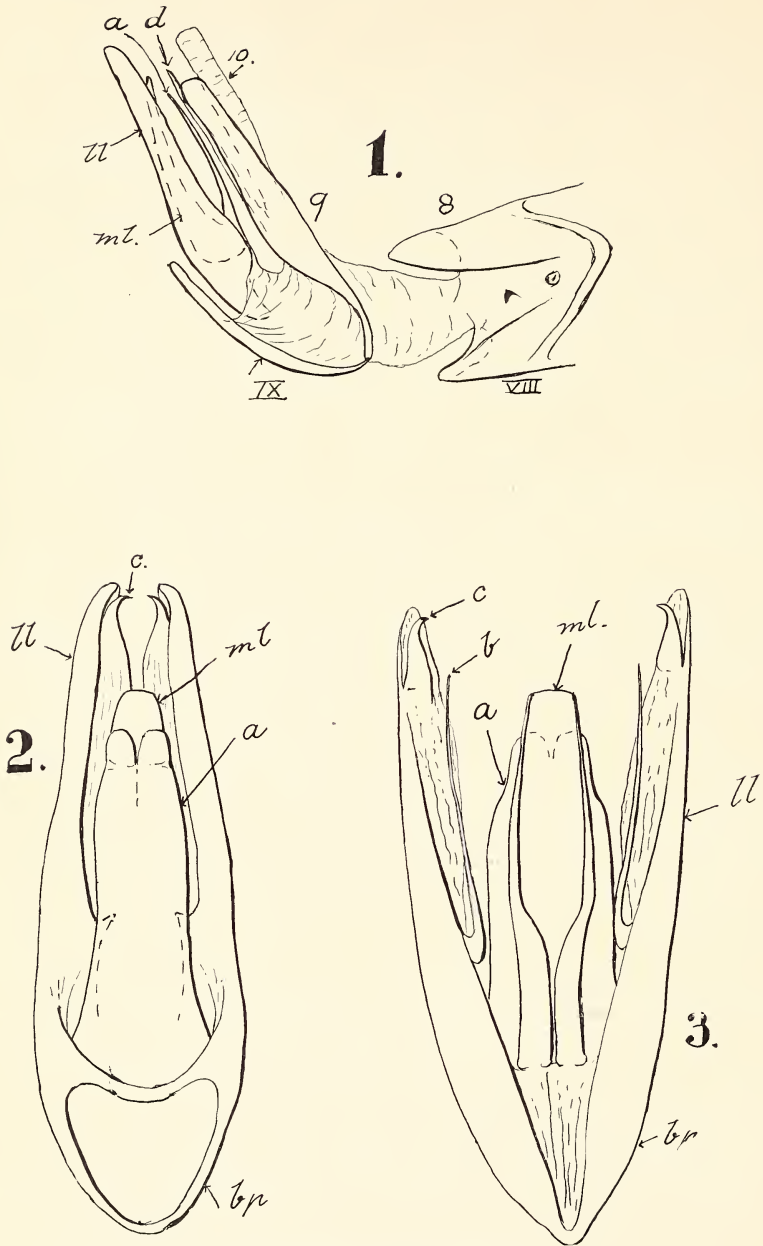
To anyone familiar with the genitalia of Mecoptera, those of *Cupes* will suggest homologies. In *Cupes* the anus opens at the apex of a tube which shows no demarcation between tergite and sternite. This anal tube (figs. 1, 10) is evidently composed of the tenth and eleventh segments. At the base of the tube on the ventral aspect there is a pair of flat appendages (fig. 1 d) which suggest cerci. This is the only case in Coleoptera in which any organs suggesting cerci are found in the male. The ninth tergite is deeply bilobed, the lobes laying above and along side the anal tube. The ninth sternite projects caudad so that the ædægus is considerably enfolded by the ninth segment. A large membrane connects the ninth segments and the normally formed eighth. The tegmen of the ædægus is not differentiated into lateral lobes and

(*) Trans. Ent. Soc. Lond., 1912, III p. 522, Pl. LIX figures 103, 103-a; 104, 104-a, 104-b.

basal piece unless we regard the spine-like process (figs. 2 and 3, c) as the lateral lobes and the large plates on each side (figs. 2 and 3, ll) as development of the basal piece. Near the middle of the ventral edge of these plates marked ll arise a long, thin spine (fig. 3, b), another unique structure in Coleoptera as far as the writers knowledge extends. On the dorsal aspect and arising from the basal ring of the tegmen there is a long, narrow plate with a bilobed apex (figs. 2 and 3, a). This can be compared to a similarly situated plate in *Enarsus bakewelli*, *Dascillus cervinus* and *Atractocerus africanus*, and such a plate amalgamated to the median lobe would produce such a form as is found in *Lissomus bicolor*. The functional orifice of the median lobe extends from the apex to the base of the ventral aspect, the edges being brought near together at the base, so that the median lobe does not form a tube.

In the larvæ of *C. concolor* the ninth sternite is short and posterior to it there are two large oval processes with a minute process at the apex of each. These strongly suggest coxites and styles. Unfortunately the only pupa Dr. Tillyard possessed was a female, the imago of which could be seen within the pupal skin and the styles of the adult lay within the styles of the pupa. The cerci were also present in the pupa. A pupa of a male in the same stage of development might throw light upon the homologies of the male genitalia.

Although the genitalia of *Cupes* is more complex than is found in most other Coleoptera, I am inclined to consider it as a primitive form. The line of evolution of the genitalia in Coleoptera is from a complex form to a simple. In some forms (i. e. *Paropsis variolosa*) the tegmen is nearly suppressed and the median lobe, along with an internal sac, forms the functional organ; often the remaining portion reaches great complexity (i. e. *Xantholinus*). In other forms (i. e. *Prostenus dejeani*) the median lobe is nearly suppressed and the tegmen is the chief structure. It would be easy to compare the tegmen of *Cupes* with the outer portion of the genitalia of aculeate Hymenoptera which, although more complex, I consider as more primitive. In some of the parasitic Hymenoptera, which are evidently highly modified forms, the ædœagus



CUPES CONCOLOR.

is quite similar to the primitive Coleoptera, having a well developed basal piece, distinct lateral lobes and a tubular median lobe.

A complete study of the development of *Cupes* might throw light on the male genitalia of Coleoptera and other orders.

EXPLANATION OF PLATE XIII.

Fig. 1. Lateral view of last abdominal segments and genitalia of *Cupes concolor*.

Fig. 2. Dorsal view of ædœagus of *Cupes concolor*.

Fig. 3. Ventral view of ædœagus of *Cupes concolor*.

a. dorsal plate; b. spine on margin of lateral lobe; c. spine at apex of lateral lobe; d. cerci; bp. basal piece; ll. lateral lobes; ml. median lobes. 8, 9, tergites; VIII, IX, sternities; 10 anal segment.

1923 COLLECTING NOTES.

BY W. KNAUS,

McPHERSON, KANSAS.

The collecting season of 1923 in the Sand Hill country southwest of Medora, Reno County, Kansas, was one of the best in recent years. Weather conditions were especially favorable, the vegetation being abundant. Notably numerous in specimens was the large scarabæid, *Strategus mormon*, Burm., scores of examples being taken by students of McPherson College, a party of four from the State University at Lawrence, Kansas, and the writer, in May, June and the first week in July.

For the first time in a collecting experience of thirty-five years in this region, *Phyllophaga longitarsus* Lec. was taken and in abundance, at light, during the first and second weeks in July. During the day they burrow in the sand, and being almost indistinguishable in color, are never seen. They are also taken on the sand dunes of Smoky Hill river, near Manhattan, Kansas, at light.

A large scarabæid attracted by light the past season, near Medora, was *Polyphylla hammondi* Lec. Among thirty specimens coming to light the first week in July only five were females, and I have never taken a higher proportion of this sex.

The last week in June, 1902, I took at Englewood, Kansas, 175 miles southwest of Medora, numbers of a small light colored *Aphodius* which was described in 1905 by H. C. Fall, as *A. knausi*. I never took this species again until the first week in July last season when it was very abundant at light in the sand hills near Medora. No specimens were seen during the day.

In past years, occasional specimens of *Anomala ludoviciana* Schaeffer were picked up in the sand hills, but this past season during the last week in June, between 5 and 7 o'clock in the afternoon, this species was found in numbers on sand and on low vegetation, mating. They are sluggish in movement, and no net is required to take them. A form of *Anomala flavipennis, modulata* Casey, is taken at light, the first and second weeks in July.

The last of May and the first half of June, *Serica ochrosoma* Dawson is attracted to light but rarely in numbers; last season

only five were taken. They feed on cottonwood leaves during the early part of the evening.

Bolbocerus fossatus Say. was not very abundant, only a half dozen specimens being taken. They were mostly found in perpendicular holes, eight to twelve inches deep, in the sand, but two or three came to light.

Cicindela lepida Dej. was very abundant on bare sand "blow outs" and adjacent to pools of water in the "blow outs". It was very abundant the last part of June and the first half of July. The form *insomnis* Casey, with green head and thorax, occurred infrequently, not to exceed one to twenty of the ordinary form. *Lepida* is attracted to light and by carrying a gasoline lantern or using a flash light can be picked up on the bare sand.

Cicindela hirticollis Say. was abundant near pools of water in the "blow outs" in company with *lepida*. *Cicindela lengi* W. Horn. was more than usually common around sand dunes, the individuals taking shelter in the shade of vegetation to escape the heat of the sun. *Formosa* Say. also occurred in numbers, and is much more wary than *lengi*. The common *scutellaris* Say. was also abundant during May, June and the first part of July.

The milkweed cerambycid *Tetraopes canescens* Lec. was taken in numbers from mid-June to mid-July. Light, the first and second weeks in July, attracted several specimens of *Ochodæus kansanus* Fall.

On July 4th, four members of the Kansas University Entomological Summer Field Force, Kenneth Krehbiel and the writer visited Belvidere, Kiowa County, 150 miles southwest of McPherson, and collected on the evening of that day, July 5th, and until the afternoon of July 6th. On a salt marsh just north of Belvidere, *Cicindela circumpecta* Laf., *Cicindela* var. *globicollis* Casey, *Cicindela macra* Lec. *Cicindela knausi* Leng. and two or three specimens of *Cicindela fulgida* Lec. were taken. The first three were abundant on the salt encrusted flats, while *knausi* occurred on damp mud near water. The *circumpecta* were of the brown, green and rarely the blue form. On thistle heads several *Trichiotina texanus* Horn were taken.

In a small rock cave a mile and a half from Belvidere numbers of *Griburius montezumæ* var., a very handsome chrysomelid were taken, resting and mating on the cave roof. A variety of this without elytral markings was found in a similar cave a week later in Ellsworth County, by the Kansas University expedition. In 1919 the writer took *Griburius montezumæ* near Bellvue, southwest Utah, in June, on live oak foliage. Their feeding habits were not noted at Belvidere or in Ellsworth County.

Pelidnota punctata Linn. larvæ, pupæ, and newly transformed imagæes were found in a decayed elm log on Medicine Lodge Creek at Belvidere. At light, *Phyllophaga summucida* Lec., *Polyphylla hammondi* Lec., *Cicindela macra* Lec., *Helluomorpha præusta* Dej., *Macrobasis immaculata* Say. and *unicolor* Kirby were not uncommon.

The last half of May and the first half of June, *Leonidia neomexicana* Cockerell emerged in numbers from the urn cells of *Anthophora occidentalis* Cresson, a solitary bee in the cell of which *Leonidia* is parasitic, the larvæ of *Leonidia* feeding on the food stored for the larvæ of *Anthophora*. A male and female of *Leonidia*, a few hours after emergence, were confined in a test tube. They mated at once, and the female deposited many eggs in the tube. The larvæ emerged in four or five days in large numbers. They were very small and light yellow. They lived from five to ten days and were extremely active, moving over the glass surface very swiftly for such minute animals.

Leonidia neomexicana was described by Professor T. D. A. Cockerell in 1898 from specimens reared from bee cells at Mesilla, New Mexico. In 1911 Professor Creighton Wellman described specimens collected in Logan and Grove Counties by the Kansas University entomological expedition in 1910 as *Hornia gigantea*. Specimens of *Hornia gigantea* placed in the hands of H. C. Fall at Tyngsboro, Massachusetts, in the latter part of 1922, and compared by him with specimens of *Leonidia* in his collection showed that *Hornia gigantea* was a synonym of *Leonidia neomexicana*.

Four specimens of *Bolboceriosoma* received from Mr. W. J. Brown, Stillwater, Payne County, Oklahoma, and one specimen

from Rush County, Kansas, proved to be *biplagiatum* D. & McC. *B. bruneri* D. & McC. seems to be distributed over central and northern Kansas, *biplagiatum* over the south half and *pusillum* D. & McC., over the northeastern part. So far, only *bruneri* has been taken at McPherson.

TWO MINOR PESTS FROM EUROPE (LEPIDOPTERA, PLUTELLIDAE).

We have been running a trap light again on the Cornell campus at Ithaca, New York, this year and have obtained specimens of two introduced Lepidoptera of a certain interest (see Canadian Ent. 55, 151).

Ocnerostoma piniariella Z. (European Pine Leaf-miner). Numerous specimens were taken in the first half of July, and the species is obviously well established. I think it has never been reported from the New World, but was taken here by Comstock in 1882. It has not been seen in the meantime, but is so minute and obscure that it has probably been overlooked. It looks like a *Coleophora*, being slender, with a slightly ruffled head, forming a sort of ragged eyecap over the bases of the antennæ, but unlike *Coleophora* it throws its antennæ back when at rest. It is nearly white when fresh, but the hind wings and under side are gray, and even slightly rubbed specimens appear ash gray. Dead specimens may be distinguished from *Coleophora* by the well developed epiphysis on the fore tibia, as well as the different venation (see Spuler, Schmetterlinge Europas, vol 2, fig. 200).

Cerostoma xylostella L. (Honeysuckle Leaf-roller). This striking species is well known about Boston, but appeared at Ithaca for the first time this July, three specimens being taken in the trap and another seen. It is chocolate brown with the dorsal edge of the wings and the middle of the thorax bright yellow; it throws its antennæ forward at rest like the other close relatives of *Plutella*, and this and its large bushy palpi give it a certain likeness to a caddis fly (say *Tricnodes borealis*).

WM. T. M. FORBES.

FROGS AS INSECT COLLECTORS.*

BY S. W. FROST,

STATE COLLEGE, PA.

Since 1915, the writer has been accumulating data on the food of the common frogs of the Eastern United States; *Rana catesbeana* Shaw., *Rana clamitans* Latreille, *Rana sylvatica* Le Conte, *Rana palustris* Le Conte, *Rana pipiens* Schreber and *Hyla pickerinii* Holbrook. The frogs for this study were collected in Pennsylvania and New York state throughout the summer months from April until November. They were immediately placed in formaldehyde or alcohol to prevent further digestion of the contents of their stomachs. Many of the frogs examined by previous workers were not collected for food examination and much valuable material was lost because the digestion continued until the frogs were pickled upon return to the laboratory. The contents of the stomachs were examined by the wet method, that is under alcohol or formaldehyde as it was found that delicate structures such as the wings of insects or larval skins could not be adequately detected when dry. An attempt was made to collect one hundred specimens of each species a month in order that a thorough study of their food might be made. By conducting the work in this manner, the variety that occurs in the food diet throughout the season, the differences in the food diet of the various species, their feeding activities during the breeding season and their activities during the day time and the night time could be determined.

In the course of the study, it was soon realized that insects and Crustacea form the principal diet of frogs and that they are often unconsciously excellent collectors of certain rare insects. Several interesting and valuable records of the distribution of insects have been secured from specimens taken from the alimentary canals of frogs. They appear in many cases to be better collectors than some entomologists. Their proximity to the

*This work was done at Cornell University under the direction of Dr. A. H. Wright and was presented before the Ecological Society of America at Boston, December 28, 1922.

ground, alertness and ability to reach places where man finds it difficult, no doubt account for this.

The food of frogs, in general, consists of several groups of animals: Annulata (worms), Mollusca (snails), Crustacea (crayfishes), Arachnida (spiders, scorpions, mites, etc.), Hexapoda (insects), and Amphibia (frogs). The latter reveals their cannibalistic habits. Some writers, on the presence of a feather or mammal's hair, include the Aves and the Mammalia in the food list. The writer, after an examination of over five hundred frogs, is unable to add these as food, although bird feathers were found on two occasions within the stomachs of frogs. An extraordinary bit of diet was found in a bullfrog, now in the collection at Cornell University, which swallowed a young alligator; the tip of its tail was protruding from the frog's mouth at the time the specimen was observed. Such unique morsels of food are sometimes found, but they are unusual rather than the favorite diet of the frogs. There is no doubt, that amid the great variety of food, insects form their principal diet. This is true, unless it be one species, *Rana catesbeana*, which has been more often found filled with Crustacea and Arachnida.

The problem of the food of frogs resolves itself, in a large degree, to a study of their insect diet and it is natural therefore that an abundance of interesting notes have been secured on insect distribution. In identifying the food contents of frogs, the orders, families, genera and in many cases the species have been determined. The identification of the species has been left to specialists. The work was conducted at Ithaca, N. Y., where the following specialists were available: Dr. O. A. Johannsen (Diptera), Dr. Wm. T. Forbes (Lepidoptera), Prof. C. R. Crosby (Arachnida), Dr. J. C. Bradley (Hymenoptera), Mr. Henry Dietrich (Coleoptera adults). Mr. Adam Boöving of Washington, D. C., was kind enough to determine the Coleoptera, larvæ. The efforts and co-operation of these systematists have greatly enhanced the value of the work. Much of the material is still undetermined including the Lepidoptera and the Hymenoptera, however considerable data have been accumulated on the Diptera, Coleoptera and Arachnida, which add greatly to our knowledge on this subject.

The determination of the contents of the alimentary canal is not a difficult task but is often tedious work. Upon the first examination of the contents of a stomach, nothing but a mass of material can be distinguished. This must be carefully picked apart before any material can be determined or even before insects or other forms can be recognized. Earth worms crowd the alimentary canal with considerable earth, moths, with scales, caterpillars, with hair, and in addition to these, one finds gravel, stones, leaves, seeds and other foreign material. Within the intestine the food is found in a more moist condition, and there is usually very little material at any time. The colon is often jammed with a quantity of material much of which is considerably digested and frequently beyond recognition. The elytra of beetles, heads and legs of many insects often remain to tell the story while the wings of insects may be badly twisted and torn, but still they can be unfolded and the family, genus and sometimes the species determined.

An extraordinary wide variety of insects has been secured from the contents of the alimentary canals of frogs. Representatives of fifteen of the nineteen order of insects recognized by Prof. J. H. Comstock have been taken and numerous families and genera are represented. The two parasitic orders Siphonaptera and Mallophaga would probably never be found unless taken upon their hosts. There is no reason to doubt that the other two orders might be eaten by frogs should they come in their path. Sometimes only a single specimen of a species was found, while at other times a large number of specimens was taken. Ants and beetles, especially the Carabidæ and the Curculionidæ, form a large part of their diet. In one case 53 ants were found in a single stomach of a bullfrog, while in another, 114 were found. The beetles are mostly large and dark colored and form attractive food for the frogs. Twelve Curculionidæ (*Phyxeles rigidus* Say), were taken from a single stomach. Flies (Diptera) likewise were found, at times, in large numbers. In opening the stomach of a green frog, the writer found fifteen specimens of *Eristalis arbustorum* (Syrphidæ). Other insects, as the Collembola, aphids, psocids and such as naturally occur in colonies, were often found in large numbers. Two groups of Arthropods, the Hexapoda and Arachnida, have thus far been found exceedingly interesting and in such

good condition that a large number of species has been determined. The larvæ of the Stratiomyidæ (Diptera) and the Arachnida (spiders) have yielded new distribution records for the fauna of New York State.

The adults of the Stratiomyidæ have not been found abundant but the larvæ have attracted much attention. These have been taken from the green, bull and meadow frogs. They are among the most beautiful of the dipterous larvæ and are readily recognized amidst the trash of the stomach contents. Five genera have been taken from frogs; *Stratiomyia*, *Odontomyia*, *Nemotelus*, *Allognosta* and *Oxycera*. The larvæ of the first five genera are known to be aquatic in their habits. *Odontomyia* adds a new larva of a local species to the collection at Cornell University. That of *Nemotelus* lends the first larval record of a North American species. Such a variety of stratiomyid larvæ is more than a dipterist has in his own collection. These larvæ were found in a beautiful condition. The weak acids of the frog's stomach remove the fatty material from the larvæ and render them in as fine a condition as specimens treated with weak potassium hydroxide at the laboratory. The skins are thereby made transparent and reveal the setæ and head structures clearly. The skins of such larvæ can be very easily determined.

Spiders were likewise found in abundance and many times in excellent states of preservation. Often it was necessary to do much cleaning before the spider was even visible because the legs would frequently curl up and entangle large masses of digested food. The male palpi, a valuable character in taxonomic work, are made more distinct and are often extended to their full length by the action of the digestive fluids of the frog. Such specimens are frequently more tempting to the systematists than poorly collected or preserved material. Spiders were found in greatest abundance in the pickerel, meadow, green and wood frogs. Fourteen species have been determined; *Pirata insularis* Em., *Pardosa moesta* Beck and *Clubiona abbotii* Koch were taken most frequently. *Schizocosa crassipalpis* Em., adds a new record to the list of spiders of New York State. Three specimens of this species were taken; two from a meadow frog and one from a pickerel frog.

As one studies the food of frogs, one realizes more and more that the food is gathered from insects dwelling on or near the ground or near the surface of the water. The Carabidæ, living near the ground, the snout beetles (Curculionidæ), dropping to the ground when disturbed, the Syrphidæ hovering over ponds, the water striders and beetles living on the surface of the water; all of these make inviting and easily obtainable food. The amount of food taken from the water, as aquatic larva, is considerable and greater than has been hitherto stated. In addition to the food and trash found in frogs, large numbers of parasites have been found. These cannot be properly considered as food but their presence is worth mentioning. *Hyla pickeringii* yielded large numbers of nematodes. Flukes also were found in some frogs.

The records thus far secured, have been a great incentive to continue the work, not alone for the valuable contribution it may be to a study of the food of frogs, but also for the possibility of adding new records and new species to our fauna. This study has opened a new field for exploitation and a new source for records of insects' distribution.

LARVAE OF INSECTS RECOVERED FROM THE ALIMENTARY CANALS OF FROGS.*

Order, Family, Species.	Number of specimens recovered.
LEPIDOPTERA	
Satyridæ	
<i>Satyrodes acanthus</i> Linn.	2
Geometridæ	
<i>Xanthrohoe</i> sp.	1
Lasiocampidæ	
<i>Malacosoma disstria</i> Hubn.	1
Gelechiidæ	
Undetermined species	1
Noctuidæ	
<i>Nephelodes emmedonia</i> Cram.	1
<i>Catocala</i> species	1

*Many of the Lepidoptera and all of the Hymenoptera are still undetermined.

Order, Family, Species.	Number of specimens recovered.
<i>Leucania</i> species	1
<i>Noctua</i> species	1

COLEOPTERA

Carabidæ	
<i>Pterostichus</i> species	3
<i>Chlaenius</i> species	4
Dytiscidæ	
<i>Agabus</i> species	1
Hydrophilidæ	
<i>Hydrobius globosus</i> Say	1
<i>Tropisternus</i> species	1
Silphidæ	
<i>Silpha</i> species	1
Staphylinidæ	
<i>Quedius</i> species	1
Histeridæ	
Undetermined species	1
Lampyridæ	
<i>Photinus</i> species	1
<i>Telephorus</i> species	9
Chrysomelidæ	
<i>Leptinotarsis</i> species	1

DIPTERA

Mycetophilidæ	
<i>Sciara</i> species	4
Tipulidæ	
<i>Tipula bella</i>	1
Muscidæ	
Undetermined species	1
Stratiomyiidæ	
<i>Oxycera picta</i> V. d. W.	1
<i>Stratiomyia</i> species	3
<i>Nemotelus</i> species	1
<i>Odontomyia</i> species	1
<i>Allognosta</i> species	1

NEUROPTERA

Chrysopidæ	
<i>Chrysops</i> species	1

ADULT INSECTS RECOVERED FROM THE ALIMENTARY
CANALS OF FROGS.†

Order, Family, Species.	Number of specimens recovered.
THYSANURA undetermined	
EPHEMERIDAE undetermined	
ODONATA undetermined	
PLECOPTERA undetermined	
CORRODENTIA undetermined	
ORTHOPTERA	
Blattidæ	
<i>Parcoblatta pennsylvanica</i> De. Geer.....	1
PHYSOPODA	
Undetermined	
HEMIPTERA	
Jassidæ	
<i>Helochara communis</i> Say	6
<i>Draculacephala aquilifera</i> Walk.....	1
Tingitidæ	
<i>Corythucha juglandis</i> Say	2
Hydrobatidæ	
<i>Gerris remigis</i> Say	2
<i>Gerris marginata</i> Say.....	4
Reduviidæ	
<i>Reduviolus fesus</i> L	1
Pentatomidæ	
<i>Euschistus custignus</i> Say	1
<i>Euschistus fissilis</i> Uhl.	1
Saldidæ	
<i>Lampracanthia anthracina</i> Uhler	1
Corimelaenidæ	
<i>Thyrecoris unicolor</i> P. B.	6
NEUROPTERA	
Sialidæ	
<i>Chauliodes sericornis</i> Say	1
Chrysopidæ	
<i>Chrysops</i> species	2
MECOPTERA	
Panorpidæ	
<i>Panorpa</i> species	1

† This list contains only material determined to genus or species. The insects of many of the orders are still undetermined.

TRICHOPTERA

Undetermined

LEPIDOPTERA

Undetermined

DIPTERA

Chironomidae

Chironomus decorus 1

Mycetophilidae

Sciara species 2

Tipulidae

Tipula bella Loew 1*Tipula dietziana* Alex. 1*Tipula* near *tephrocephala* Loew. 1*Erioptera graphica* O. S. 1*Erioptera armata* O. S.* 2*Gonomyia subcinerea* O. S. 2*Gonomyia sulphurella* O. S. 1*Pilaria tenuipes* Say. 1*Ptychoptera rufocincta* O. S. 1

Trypetidae

Urellia species 1*Eutreta* species 2

Platypezidae

Platypeza species 1

Syrphidae

Eristalis arbustorum 15

COLEOPTERA

Cicindelidae

Cicindela sexguttata Fab. 1

Carabidae

Bembidium nigrum Say. 1*Bembidium flavopictum* Mots. 1*Pterostichus* species 1*Poecilus lucublandus* Say 18*Amara insensu* L. & H. 1*Platynus melanarius* Dej. 3*Platynus tenuis* Lec. 2*Platynus excavatus* Dej. 1*Lebia* species 1*Chlaenius* species 1*Harpalus dichrous* Dej. 1*Stenolophus fuliginosus* Dej. 1*Stenolophus riparius* L. 1*Anisodactylus* species 3*Micromaseus patruelis* (Dej.) 1

<i>Pseudargutor erythropus</i> (Dej.)	1
<i>Triaena angustata</i> (Say.)	6
<i>Triliarthrus kirbyi</i> (Horn)	1
Dytiscidæ	
<i>Agabus semivittatus</i> Lec.	1
Hydrophilidæ	
<i>Helophorus</i> species	1
<i>Creniphilus</i> species	1
Bestrichidæ	
Undetermined	1
Cupesidæ	
<i>Cupes concolor</i> Westw.	1
Scarabaeidæ	
<i>Aphodius fimetarius</i> Linn.	1
<i>Ataenius cognatus</i> (Lec.)	1
Chrysomelidæ	
<i>Donacia rufra</i> Say	6
<i>Calligrapha similis</i> Rogers	1
<i>Calligrapha philadelphica</i> Linn.	1
<i>Calligrapha elegens</i> Oliv	2
<i>Calligrapha bisbyana</i> Kirby	4
<i>Lina interrupta</i> Fab.	1
<i>Lina lapponica</i> (L)	1
<i>Cerotoma trifurcata</i> Forst	6
<i>Prasocuris vittata</i> Oliv.	2
<i>Leptinotarsa decimlineata</i> Say	1
<i>Galerucella nymphacae</i> L.	8
<i>Diabrotica 12 punctata</i> Fabr.	1
<i>Oedionychis vians</i> Illig.	1
<i>Disonycha pennsylvanica</i> Illig.	1
<i>Disonycha xanthomelaena</i> Dalm.	2
<i>Mantura floridana</i> Crotch	1
<i>Systema taeniata</i> Say	1
<i>Anthoboscus ruricola</i> (Oliv.)	1
Anthicidæ	
Undetermined species	15
Staphylinidæ	
<i>Staphylinus mysticus</i> Erichs.	1
<i>Philinothus</i> species	4
<i>Stenus</i> species	4
<i>Lathrobium</i> species	1
<i>Palaminus testaceus</i> Erichs.	1
<i>Gastrolobium bicolor</i> (Grav.)	1

Coccinellidæ

<i>Hippodamia parenthesis</i> Say	1
<i>Hippodamia 13 punctata</i> Linn.	2
<i>Coccinella transversoguttata</i> Fald.	1
<i>Adalia bipunctata</i> (L)	1
<i>Hyperaspis undulata</i> (Say)	2
<i>Chilocorus bivulnerus</i> Muls.	1
<i>Ceratomegilla maculata</i> De Geer	4
<i>Ceratomegilla fuscilabris</i> (Muls)	1

Erotylidæ

<i>Languria mozardi</i> Latr.	1
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Cryptophagidæ

<i>Ceratophagus abbreviatus</i> Say	9
<i>Tomarus pulchellus</i> Lec.	3
<i>Atomaria</i> species	1
<i>Anchicera ephippiata</i> Zimm.	1

Dermestidæ

<i>Dermestes lardarius</i> Linn.	1
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Nitidulidæ

<i>Epuraea helvola</i> Erichs	1
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Lathridiidæ

<i>Corticaria</i> species	1
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Heteroceridæ

<i>Heterocerus</i> species	5
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Byrrhidæ

<i>Limnichus punctatus</i> Lec.	1
--------------------------------------	---

Dascyllidæ

An undetermined species	1
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Elateridæ

<i>Melanotus</i> species	1
<i>Agriotes mancus</i> (Say)	15
<i>Ludius tarsalis</i> (Melsh)	3
<i>Monocrepidius auritus</i> (Hbst.)	2
<i>Dolopius lateralis</i> Esch.	1

Dryopidæ

<i>Helicus lithophilus</i> (Germ.)	1
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Lampyridæ

<i>Photinus</i> species	1
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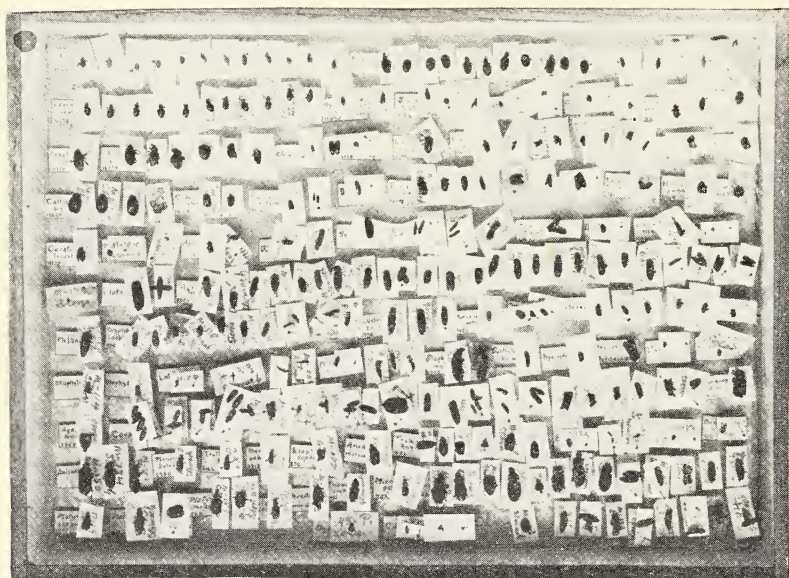
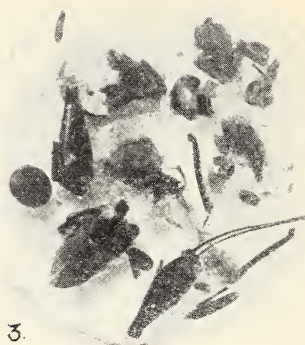
Curculionidæ

<i>Phyxelis rigidus</i> Say.	12
<i>Homorus undulatus</i> (Uhler)	1
<i>Brachyrhinus rugifrons</i> Gyll	11
<i>Brachyrhinus ovatus</i> Linn.	11
<i>Sitonia hispidula</i> Fab.	4
<i>Phytonomus nigrirostris</i> Fab.	1

<i>Hyperodes porcellus</i> Say	7
<i>Notaris puncticollis</i> (Lec.)	2
<i>Onychylis nigerostri</i> Boh.	1
<i>Anthonomus</i> species	1
<i>Ceutorhynchus marginatus</i> Payk.	2
<i>Conotrachelus anaglypticus</i> Say.	1
<i>Cryptorhynchus lapathi</i> Linn.	1
<i>Hypera punctata</i> (Fab.)	6

ARACHNIDA RECOVERED FROM THE ALIMENTARY CANALS OF FROGS.

Family, Species.	Number of specimens recovered.
Clubionidæ	
<i>Clubiona</i> species	2
<i>Clubiona abbotii</i> Koch.	3
<i>Clubiona mixta</i> Em.	1
Lycosidæ	
<i>Lycosa</i> species	3
<i>Lycosa erratica</i> Hlz.	1
<i>Pirata insularis</i> Em.	3
<i>Pirata febriculosus</i> Beck	1
<i>Pardosa moesta</i> Banks.	4
<i>Pardosa milvina</i> Hlz.	1
<i>Schizocosa crassipalpis</i> Em.	1
Thomisidæ	
<i>Oxyptila censpurcata</i>	3
<i>Xysticus ferox</i> Hlz.	6
Mimetidæ	
<i>Ero furcata</i> Vill.	1
Linyphiidæ	
<i>Erigone</i> species	3
<i>Linyphia calthrata</i>	2
Agelenidæ	
<i>Agelena naevia</i>	1
Attidæ	
<i>Stitticus palustris</i> Peck.	1
Cheliferidæ	
An undetermined species	1



FROGS AS INSECT COLLECTORS.

EXPLANATION OF PLATE XIV.

- Fig. 1. Alimentary canal of Wood frog showing;
 (a) stomach,
 (b) intestine,
 (c) colon.
- Fig. 2. Compact mass of food from stomach before separation for determination.
- Fig. 3. Contents of the same stomach shown in figure 2 after pick-apart, showing body, head legs and ovipositor of cricket, hairs of lepidopterous larva and hemlock leaves.
- Fig. 4. A collection of *Coleoptera* taken from alimentary canals of frogs showing the fine state of preservation of some and the method of labelling.

NOTES ON THE BUPRESTIDAE OF OREGON WITH DESCRIPTIONS OF NEW SPECIES.

By W. J. CHAMBERLIN,

FOREST ENTOMOLOGIST, OREGON STATE COLLEGE.

The Buprestidæ are usually considered as tropical insects, yet some 380 species are known from the United States and sixty-three of these have been taken in Oregon. Of the sixty-three species listed, fifty-six are represented by Oregon specimens in the author's collection. Two of the remaining species have been seen bearing Oregon labels and the other five are included on the best of authority such as that of Leconte, Horn and Fall.

Sixteen of the species listed below have not been reported heretofore from Oregon and two new species are herewith described.

The Oregon species belong in twelve different genera, as follows:

I. *Chalcophora* Sol.

1. *C. angulicollis* Lec. A common species throughout the state.

II. *Dicerca* Esch.

2. *D. prolongata* Lec. Quite common on *Populus tremuloides*; occasionally found on willow.
3. *D. pectorosa* Lec. This species is becoming a serious pest in orchards working in the lower trunks and roots of prune trees. Its native hosts are *Prunus subcordata* and *P. demissa*.
4. *D. tenebrosa* Kirby. Quite common breeds in *Pinus* and *Abies*.
5. *D. sexualis* Crotch. Not common, occurs early on Douglas Fir.
6. *D. horni* Crotch. Rare, found in oak regions of southern Oregon.
7. *D. lurida*. Fab. A single specimen of this typical eastern species was taken at Corvallis on June 30th. It has probably been introduced and may become established here as Dr. Burke reports *D. obscura* as breeding in ash in California. This species not previously reported from Oregon.

III. *Trachykele* Mars.

8. *T. opulenta* Fall. Only two specimens of this rare beetle have been taken here to my knowledge, one flying at Corvallis, May 4; another chopped from its pupal cell in *Libocedrus decurrens* at Detroit on Sept. 6. It also attacks *Thuja plicata* and *Sequoia gigantea*.
9. *T. blondeli* Mars. The work of the larvæ of this beetle is very common in cedar from the coast up to 2000 feet and a quantity of the larvæ may be chopped out at any season of the year. The adults are seldom seen. Most of the specimens in collections have been taken from their pupal cells, usually dead. Many individuals become mature but for some reason fail to cut their way out of the tree. Fully mature, apparently normal adults were found June 26 in their cells in cedar at Oakridge, Oregon, having made no effort to cut through the one-eighth of an inch of bark covering the large pupal cell. Much loss is occasioned by the larval mines in cedars, some operators estimating their loss to shingle material at from 15 to 30 percent of the cut, over limited areas. The reported hosts for this species are *Thuja plicata*, *Juniperus occidentalis*, *Cupressus macrocarpa*, *C. sargentii* and *C. macnabiana*.
10. *T. nimbosea* Fall. This dark bronze species is even more rare than the green forms. The hosts are the true firs of the genus *Abies*. The Oregon records are Yamhill VII-14; Corvallis V-28; Ashland IX-1 and Forest Grove VIII-7.

IV. *Pœcilonota* Esch.

11. *P. cyanipes* var. *californica* Chamb. This species is very common in certain localities on *Populus tremuloides*.
12. *P. montanus* Chamb. This species was apparently known only by the type material from Montana until recently. In June of the present year five females were taken near Oakridge, Oregon, ovipositing in the bark of injured *Populus trichocarpa*.

V. Buprestis Linn.

13. *B. aurulenta* Linn. Our most abundant species, appearing as early as March. Breeds in Douglas fir, various pines, firs and spruces. Several unusual records of the longevity of the larvæ of this species have come to our notice. Typical of these is a recent letter, reproduced below:

Portland, Oregon,
4/23/24.

To whom it may concern:—

This bug was found last evening whilst working out of the hand railing of our stairs. The railing has been varnished and kept so for nine years to my knowledge and has shown no previous borings for the deposit of the egg. It came out at the top surface from a depth of about $\frac{5}{8}$ in. I do not know that the bug is out of the ordinary run of such bugs, but the question in my mind is how long has it taken for development. If it is not asking too much, I would like to hear your opinion regards same.

Yours very truly,

C. H. Charlton, D. C.,
606 E. 10th St., So.,
Portland, Ore.

The specimen submitted with the letter was a living example of *B. aurulenta*.

14. *B. adjecta* Lec. This beautiful species is quite widely distributed but rare. Supposed to breed in *Pinus ponderosa*, and *P. contorta*. Specimens in the National Museum bear the host labels *Pseudotsuga taxifolia*, *Abies magnifica* and Jeffrey pine.
15. *B. rusticorum* Kby. A common species throughout the state. Breeds in Douglas fir and various *Abies*.
16. *B. subornata* Lec. Similar to the last, common in the pine belt. The preferred host is yellow pine.

17. *B. læviventris* Lec. A common species, often very abundant around saw mills and old logs. Adults feed on needles of young pines.
18. *B. confluenta* Say. For years I have been expecting this species to be taken in eastern Oregon but not until this year did it appear and then not in the eastern portion of the State. A beautiful male was picked up on the sidewalk in Corvallis June 30, 1924, by J. Wilcox, the first recorded specimen for Oregon.
19. *B. viridisuturalis* N. and W. Several specimens have been taken on black cottonwood in the vicinity of Corvallis.
20. *B. fasciata* Fab. A rather common species.
21. *B. Gibbsii* Lec. A rare species. I have seen some eight specimens taken in Oregon. Mostly flying. One taken July 1, 1924, on ash cordwood. Breeds in oak.
22. *B. connexa* Horn. A rare species taken from yellow pine by the author some years ago. In 1922 with Dr. Van Dyke, a series of this species was taken at an old saw mill near Halfway, Oregon. There were some 20 logs in the mill yard, part were yellow pine and part were Douglas fir. Much to our surprise we found the females selecting the fir, in preference to the pine for egg deposition. The beetles fly only during the intense heat of mid-day. Taken July 4, 5 and 6.

VI. *Melanophila* Esch.

23. *M. miranda* Lec. Reported from Oregon by Dr. Le Conte.
24. *M. acuminata* De Geer. A common species, breeding in *Pinus* and *Abies*.
25. *M. drummondi* Kby. This is probably the most abundant species of Buprestidæ in Oregon. It breeds in practically all our conifers except the cedars and junipers. I have also taken it ovipositing in living cottonwood. (*P. trichocarpa*).
Atanycolus (*Bracon*) *montivagus* Cress. and *Helcon*

fulvipes are important parasites often destroying over 50 percent of the broods.

26. *M. consputa* Lec. Taken in small numbers in Klamath County around forest fires.
27. *M. gentilis* Lec. Quite common in the yellow pine regions.
28. *M. Pini-edulis* Burke.* A single specimen taken by M. J. Miller in Jackson county.
29. *M. californica* Van Dyke. This species not previously reported from this state is quite common on yellow pine reproduction.
30. *M. intrusa* Horn. Not previously reported from Oregon. Taken at Klamath Falls VII-9; Sparta VII-2; Halfway VII-4; La Grande VII-9 and Corvallis VII-4. All specimens taken on yellow pine reproduction.

VII. *Anthaxia* Esch.

31. *A. æneogaster* L. & G. Abundant. Breeds in twigs of yellow pine, Douglas fir, redwood, willow, mountain mahogany, oak and several bushes, rose, rhodendron, redbud, etc.
32. *A. deleta*. One specimen in the National Museum collected by Schwarz at Portland V-28. I have collected numbers of them near Klamath Falls VII-9; Corvallis VII-4; VII-17; Oakridge VI-29; Ashland VII-2; La Grande VII-9. Most conveniently taken beating young yellow pine, in the twigs of which it breeds. Taken on the flowers of wild lilac at Oakridge.

VIII. *Chrysobothris* Esch.

33. *C. femorata* Fab. Fairly common in the aspen stands of eastern Oregon, occasionally found in orchards and on cottonwood and alder.
34. *C. contigua* Lec. Abundant in the yellow pine forests.
35. *Chrysobothris lilaceous* new species.

*Since seeing Dr. Burke's specimens of the true *M. pini-edulis*, I am somewhat doubtful of the identity of this Oregon specimen.

Color dark lilac bronze, thorax reddish, antennæ dark coppery bronze, first segment as long or longer than the second and third, third about as long as next two combined; front coppery with two prominent callosities and irregular raised areas coarsely punctured, rather densely clothed with white pubescence on the depressed areas; clypeus rather deeply triangularly notched (fig. 5); thorax twice as wide as long with prominent, dark median smooth area extending two-thirds from the base flanked on each side by a large irregular round area on the anterior half, a smaller less prominent one near the lateral margin; surface otherwise coarsely strigose punctured. Elytra wider than thorax, parallel about one-half the way back then gradually narrowed to the apex, margin serrulate, first costa distinctly elevated on the apical half merging into a rather broad elevated smooth space on the basal half, four basal foveæ deep and distinct, surface with numerous raised dark areas which have few punctures and these near their margins, balance of surface moderately densely, coarsely punctured. Body beneath, coppery bronze coarsely punctate; last ventral segment sinuate the emargination scarcely evident (fig. 6). Length 10.5—11 mm.

In Horn's table this species runs to *cuprascens* but can be distinguished at once by its larger size, clypeus without the teeth, the strigulose thorax and the last ventral being longer and more acuminate.

Described from three females taken on juniper (*Juniperus occidentalis*) about six miles west of Klamath Falls, Oregon, June 14, 1922, in company with numerous *C. nixa* and *viridicyanea*. The host is doubtless western juniper. Type in author's collection.

36. *C. viridicyanea* Horn. Not previously recorded from Oregon but not uncommon in *Juniperus occidentalis* in the eastern and central parts of the state.
37. *C. dolota* Horn. Quite widely distributed in the pine regions but always rare.
38. *C. dentipes* Germ. Very abundant in eastern and southern Oregon, breeds in various pines.
39. *C. carinipennis* Lec. Fairly common in the pine belt.
40. *C. californica* Lec. The type of *C. vulcancia* Lec., which is considered a synonym of *C. californica* was taken in Oregon.

41. *C. pseudotsugæ* Van Dyke. Not previously reported from Oregon. One specimen taken at Ashland in August.
42. *C. laricis* Van Dyke. The type material taken in the Blue Mountains of Oregon.
43. *C. sylvania* Fall. Rare, occurs in Douglas fir, emerges early in April.
44. *C. caurina* Horn. Breeds commonly in yellow pine twigs.
45. *Chrysobothris juniperinus* new species.

Length, male, 8.5 mm., female, 9 mm. Width 3 mm. Superficial appearance somewhat as in *cuprascens*; form rather more slender; color of elytra as in *cuprascens*, thorax and head less reddish; antennæ first joint longer than the second and third combined, third joint not as long as the next two, joints 4 to 8, prominently serrate, tip much narrowed, dull bronze, darker in female; front convex with two small, distinct callosities; dull bronze more reddish in female, coarsely closely punctured and clothed with long white pubescence, male, less so in female, Clypeus acutely notched (fig. 3); thorax more than twice as wide as long, widest in front of the middle, base and apex rather abruptly narrowed, disc irregular, no median depression, a shallow fovea near each lateral margin, surface densely evenly punctate, except where broken by slightly elevated, dark smooth areas. Elytra wider than thorax, sides almost parallel (slightly sinuous), one-half the way back, narrowing thence to the apices, margin serrulate, prominent basal foveæ, flanked by a smaller less distinct one near the outer margin; first costa distinctly elevated entire broadening out at basal third, second and third faintly evident on the raised areas; irregular raised areas occupy almost one-half the elytral surface (mainly on the basal half), these are dark, smooth, shining with a few scattered small punctures, balance of surface bronzed, moderately punctate. Under surface bronze with long white pubescence covering the prosternum, male, shorter and less dense on other parts of ventral surface; last ventral segment of male (fig. 1) with a broad semi-circular emargination; last ventral of female (fig. 2) with only a faint notch.

Prosternum distinctly lobed, the anterior tibiæ of male arcuate and dilated at the tip (fig. 4) placing the species in Dr. Horn's Group IV near *caurina* from which it is easily separated by the tibiæ, color of front and the emargination of the last ventral segment, which lacks the lateral raised areas so prominent in *caurina*.

Described from a single pair taken on freshly cut juniper (*Juniperus scopulorum*) posts in the Stein Mountains (7500 ft.

altitude), Harney County, Oregon, June 22 and June 24, in company with *C. viridicyanea*.

Another pair taken at the same place show no distinct characters by which they may be separated but are somewhat larger measuring 10.5 mm. in length and 4 mm. in width.

The host is undoubtedly the Rocky Mountain Juniper which is the only conifer in the Stein Mountains.

46. *C. breviloba* Fall. A single specimen taken in Eastern Oregon.
47. *C. monticola* Fall. Four specimens taken in the Warner Mts. Lake county June 19, on yellow pine.
48. *C. mali* Horn. This species has forty-four recorded host plants. In Oregon it is becoming a serious pest in prune, peach and walnut orchards. Hundreds of young trees have been killed shortly after being set out. It is also quite injurious to young shade trees.
49. *C. nixa* Horn. Occurs in southern Oregon in *Juniperus occidentalis*. Not previously reported from this state.
50. *C. pubescens* Fall. One specimen taken on Mt. Jefferson VII-20 seems to belong to this species. There is no other record of its occurrence here.
51. *C. deleta* Lec. A rare species which probably breeds in twigs of yellow pine. Two specimens, one flying at Condon VII-8, the other on yellow pine trimmings at Sparta VII-3.
52. *C. cyanella* Horn. I know of only three specimens of this species having been taken in Oregon. All were taken near Ashland. Breeds in yellow pine twigs, flies during June and July. Not previously reported from this State.

IX. *Polycesta* Serv.

53. *P. californica* Lec. Two specimens have been taken, one at Ashland, Oregon, by J. M. Miller and one at Gold Hill by the author.

X. Acmaeodera Esch.

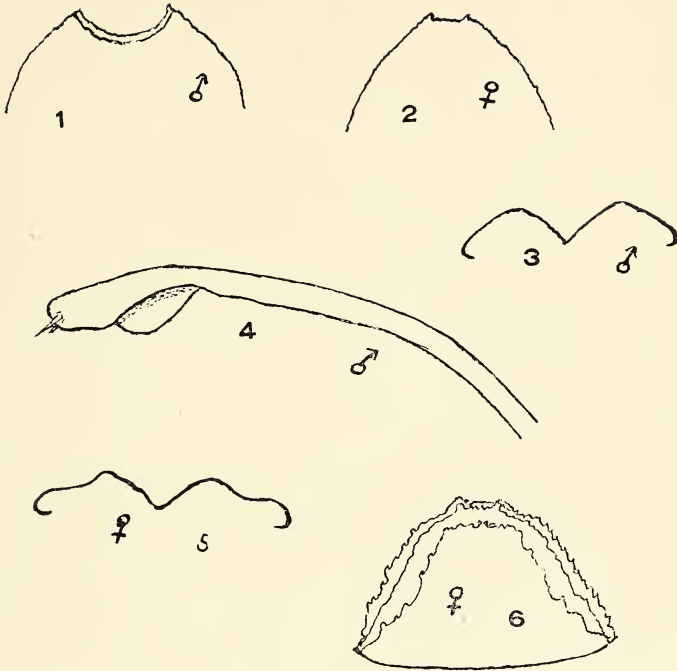
54. *A. variegata* Lec. One specimen in the National museum bears a label "Hood River, Oregon" V-21-1892. (Hubbard & Schwarz.) Fall says "*variegata* extends its range into eastern Oregon." No other species of this genus has been recorded from Oregon but the following three species occur here.
55. *A. connexa* Lec. Quite common in the open spaces of the yellow pine forests of southern Oregon. Most abundant on one of the woolly sunflowers, (*Eriophyllum lanctum*), I have taken only one specimen in any locality where mountain mahogany was not common and believe it breeds in that plant.
56. *A. vandykei* Fall. Several specimens taken on mountain mahogany (*Cercocarpus parvifolius*) west of Klammath Falls in June. One specimen at Sparta July 3.
57. *A. gemina* Horn. One specimen taken at Prospect on the Crater Lake Highway Aug. 10, 21 by Prof. A. L. Lovett.

XI. Chrysophana Lec.

58. *C. placida* Lec. Widely distributed in the southern portion of the state, but never common. Occasionally taken in the Willamette Valley as far north as Portland.

XII. Agrilus Steph.

59. *A. vittaticollis* Rand. Two specimens, Corvallis. One taken years ago flying. The second beaten from service berry VI-23-1924 by B. G. Thompson.
60. *A. niveiventris* Horn. Reported from southern Oregon by Dr. Fall. One specimen taken on Oregon alder near La Grande July 9. A series taken on black cottonwood and Oregon alder at Oakridge May 29 and June 28.
- A. anxius* Gory. Taken just over the Oregon line in Idaho and no doubt occurs in this state though so far as known no specimens have been taken.



EXPLANATION OF PLATE XV.

Fig. 1. Last ventral segment of *C. juniperinus* n. sp. ♂.

Fig. 2. Last ventral segment of *C. juniperinus* n. sp. ♀.

Fig. 3. Clypeus of *C. juniperinus* n. sp.

Fig. 4. Front tibiæ of ♂ *C. juniperinus*, n. sp.

Fig. 5. Clypeus of *C. lilaceus* n. sp.

Fig. 6. Last ventral segment of ♀ *C. lilaceus* n. sp.



61. *A. walsinghami* Cr. "Josephine County Oregon" (Horn).
62. *A. politus* Say. Common in the Cascade mountains in alder and willow.
63. *A. burki* Fisher. Occurs in limited numbers in alders.

ULTRAVIOLET AND FLOWER-VISITING HABITS OF INSECTS.

In the "Annals of the New York Academy of Sciences" (vol. xxix, pp. 233-283, April 15, 1924) there appeared an important paper by Dr. F. E. Lutz on "The Colors of Flowers and the Vision of Insects with Special Reference to Ultraviolet", which study was made in connection with the work of the National Research Council's Committee on the Biological Relations between Flowers and Insects. Dr. Lutz discusses floral colors and insect vision and shows that such colors and insect vision can not be interpreted in terms of human experiences. Special attention is paid to ultraviolet which flower visiting insects can see and which has been practically neglected by previous investigators. It is Dr. Lutz's conclusion that "floral colors have developed simply as byproducts of the plant's metabolism; that at most they are of only incidental and minor service to insects in finding flowers and that they have not been developed by any action of natural selection".

Dr. Lutz has cleared the atmosphere around the problem and in shovelling away the accumulation of entomological debris and in his dissatisfaction with cleverly worded explanations which did not explain he has uncovered new problems intimately connected with physics, chemistry and botany and his paper automatically places in the category of "history", numerous papers on floral ecology.

ED.

NOTES ON THE RUSH WEEVIL, *LIMNOBARIS* *RECTIROSTRIS* LEC., IN NEW JERSEY.

BY HARRY B. WEISS AND ERDMAN WEST

The rush weevil, *Limnobaris rectirostris* Lec., which is mentioned by Smith (Insects of New Jersey, p. 395) as occurring at Hopatcong, South Orange and Newark was found by us during the season of 1923 at Weston, Griggstown, Stirling, Rocky Hill and Monmouth Junction, all in New Jersey, and the following notes refer to observations made for the most part at Monmouth Junction.

Occasional reference to the species is found in literature. Blatchley and Leng (Rhynchophora of North Eastern America) state that it ranges from New England and Canada to Michigan and Iowa, south to South Carolina. Harrington (Canad. Ent. xxiii, p. 26) says that it is found in June in wet localities upon club-rush (*Scirpus eriophorum*) in which the larva lives.

In New Jersey at Monmouth Junction, numerous adults were found on June 18 upon *Scirpus atrovirens* and to a less extent on *Scirpus cyperinus* feeding on the flower buds and making punctures in the sheath around the lower foot of the stem. Some were feeding on the tender, developing sheaths and many were found lurking in such places. Many eggs were noted at this time and were indicated by dark-reddish, longitudinal streaks on the stem, varying from three to five millimeters in length. Many of the egg punctures were found about one-half way up the stem or in the upper twelve inches. Although a few stems contained four or five eggs, most of them had but one. The female eats a channel part way in the tissue, through the sheaths and enlarges it at the end into a small, irregular egg cavity. Some cavities were almost in the middle of the stem but most of them did not reach this far. A single whitish, smooth egg is placed in each cavity and the entrance to the channel leading to the egg chamber is closed with shreds of plant tissue. The tissue around the egg and feeding punctures in the stem later becomes dark reddish in color. Each egg is sub-cylindrical, tapering slightly at both ends which are broadly

rounded and is about 0.8 mm. long and 0.35 mm. wide. They are not unlike jelly beans in shape.

By the last of June all of the adults had disappeared and most of the eggs had hatched. After hatching the larva burrows downward making a narrow, longitudinal channel in the pith, usually close to the bark. When first hatched the larva is rather narrow and elongate but later it becomes stockier. Sometimes the channels cross from one side of the stem to the other or continue down the centre. In some cases the channel was expanded every five or six inches into little feeding pockets. By the middle of July many larvæ had reached the bottom of the stem and were feeding extensively at this point. Later they ascended their burrows to a distance of five or six inches. Practically all of the larval feeding took place in the pith and as the vascular system was uninjured no damage occurred to the plant. By the middle of August the larvæ were six or seven millimeters long and much feeding had been done in the lower twelve centimeters of the stem. In infested plants close to the water the larvæ did not descend nearly to the roots as they did in other plants but remained several inches above the ground level. During the last week of September many larvæ had started to make cells in the pith six or eight inches above the ground. In very wet places they were higher. Harrington (loc. cit.) states that the larvæ overwinter in the upper part of the burrow so as to be safe from spring flooding. The cells were from thirteen to seventeen millimeters long and from three and one-half to four millimeters wide, some of them extending the width of the stem. Each end of the cell was plugged with excrement, frass, etc. The winter is passed by the larva in the cell and transformation to the pupal stage occurs about the first or second week of May the adults issuing during the first part of June and becoming abundant about the second week. The parasite *Habrocytus langurix* Ashm. (identified by Mr. S. A. Rohwer) was reared June 18 from pupæ collected in the larval burrows.

The adult was described by Leconte in 1876 (Leconte & Horn, Proc. Amer. Phil. Soc. vol. xv, p. 315) from specimens collected in South Carolina and Illinois and a description of the larva by Dr. Adam Boving will be found in the following paper.

THE LARVA OF THE WEEVIL *LIMNOBARIS* *RECTIROSTRIS* LECONTE.

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The material on which the following description is based consists of fifteen mature larvæ of the weevil *Limnobaris rectirostris* LeConte, which kindly were sent to me for description by Mr. Harry B. Weiss, Chief, Bureau of Statistics and Inspection, State of New Jersey, Department of Agriculture, Trenton, N. J. The larvæ were collected at Monmouth Junction, New Jersey, on October 30, 1923, and have now been accessioned to the collection of coleopterous larvæ in the National Museum. When received they were preserved in alcohol. Their natural appearance does not seem to have changed greatly, except that most of them are abnormally extended resulting in the loss of distinct limitations between the different body areas.

DESCRIPTION OF MATURE LARVA.

GENERALITIES:

The larva (fig. 2) is of medium size, about 8 mm. long and 2 mm. wide; it is cylindrical, more elongate than usual in the curculionids and slightly curved.

The head (fig. 6) is yellowish-brown with darker margins and on the dorsal surface with a system of broad whitish bands which form a large figure somewhat like a reversed letter A. Very characteristic is also a dark semi-circular line posteriorly on the dorsal side of epicranium, almost parallel with the outline of the head capsule when this is seen from above.

The body (fig. 2) is mainly whitish as in most other curculionid-larvæ, but anteriorly on each side of the middle line the thin, slightly colored and indistinct prothoracic shield has a yellowish-brownish spot, and likewise on prothorax are found several small patches of yellowish-brown chitinous granulations. The largest of these patches is medianly on eusternum and has the form of a short, broad, squarish kite. The two posterior thoracic and all the abdominal segments are without chitinizations.

The abdominal segments are connected by well developed inter-segmental, wedge shaped areas or cunei (cu_1 and cu_2 , fig. 2) which are unusually large in the middle of the abdomen, and thereby contribute essentially to the characteristic length of the larva.

Each of the first to eighth abdominal segments has three tergal lobes or pleads. The anterior (psc) of these pleads has a minute seta and the posterior (scl) one carries two setæ of normal size and at least one minute. On the ventral side the sternal regions of these same segments are transversely swollen along their posterior margins probably for the sake of locomotion.

The head and footwarts are beset with several setæ but most of the body-areas carry very few and often extremely fine and short ones.

The spiracles (fig. 9) are "bifore," viz., provided with a pair of air tubes, and are rather small; they are present on mesothorax and the first eight abdominal segments; a rudimentary spiracle can with high power magnification be detected at the anterior margin of methathorax. The mesothoracic spiracle is slightly larger than the abdominal ones, it points obliquely upward and backward and the area in which it is seated is pushed into the posterior part of prothorax; however, there is a considerable distance between it and the anterior margin of prothorax. The abdominal spiracles are all of same size and point directly backward; the eighth one placed slightly more dorsal than the rest.

HEAD:

Is connected with the body by a large cervical collar and due to this membrane it may be deeply invaginated as well as greatly protruded from prothorax. From anterior margin of frons to the occipital foramen it is as long as wide.

Epicranial median suture somewhat longer than half of cranium. Epicranial ridge (ecc fig. 6) curved, extending from posterior end of epicranial suture forward to about the middle of the cranium and is subparallel with the lateral outlines of the head, when this is viewed from above. Each epicranial half with six setæ arranged as shown in figure 6.

Ocelli (figs. 2, 6) two on each side, both reduced to pigmented optical spots. The first and decidedly the larger spot is placed

near the antenna; the second spot is behind the first and nearer than this to the middle line, is indistinct and about of the same size as one of the sensory punctures.

Frons about two-thirds the length of the epicranial suture; frontal sutures form an angle of about 120° ; median frontal carina (fc fig. 6) strong. Four minute setæ on each side on the anterior frontal margin and two long setæ on each side of the frontal plate behind its anterior margin; the arrangement and relative size of the setæ as shown in the figure; about five sensory punctures on each side.

Antenna (fig. 1) very small, two-jointed. Basal joint (b) not higher but considerably wider than the apical joint, with four minute setæ and one seta as long as the apical joint. Apical joint (a) conical, without seta.

Clypeus transverse; length to width about as 1 to 3; width about half as large as distance between antennæ; widest behind; lateral margins convex. No setæ but three sensory punctures.

Labrum transverse, anterior margin convex; extreme length medianly, about as long as clypeus; width about three times the length. Dorsal face of labrum (fig. 6) on each side with three setæ, one of normal size, the two others small. Along the anterior margin on each side with a lateral group of three short, stout setæ and a median group of two of about same shape but slightly shorter. Ventral face (or epipharynx) with two setæ, one (e^1) anterior and thick, the other (e^2) posterior and fine and placed inside of the anterior end of the epipharyngeal rod (er fig. 7).

Mandible subtriangular (figs. 4, 5, 7), somewhat larger at base than apically; inside concave, gouge shaped; distally with five teeth, external tooth on ventral side (5 fig. 5, 7) small; inner dorsal margin anteriorly with a low, heel like projection (h figs. 4, 5, 7). One seta above the middle of external face; a few sensory punctures on dorsal face.

Maxilla (figs. 3, 8) with cardo (ca) smooth, yellowish-brown and no seta. Stipes proper (st), smooth, yellowish brown with one seta and several sensory punctures. Palpiger (g) soft, retractible; with two setæ on ventral face and two small setæ on the dorsal (buccal) face. Maxillary lobe (or mala) single, large,

reaching to the middle of apical joint of palpus; on the ventral face with several minute setæ; on the buccal face with about ten stout setæ mostly of medium length (m fig. 8). Maxillary palp (p) short, with two joints; basal joint a little longer and about twice as wide as the apical, which is conical, obtuse and about one-half time longer than wide; basal joint with about three minute setæ and some sensory punctures; apical article finely papillose at the tip; with one puncture.

Subfacial area (sf fig. 3) undivided, probably formed by a fusion of the mental, submental and maxillary articulating areas; it carries one well developed seta and two minute setæ and also a patch of yellowish-brown, chitinous granulations on each side.

Labial stipites (fig. 3 and stil fig. 10) are amalgamated medianly and the fused formation is posteriorly limited by an unpaired, anteriorly concave, biarcuate, in the middle spear like chitinization; one long seta on the middle of each labial stipes. Ligula thick and short; ventral surface (li) with one seta, dorsal surface (ln) without seta.

Paragnatha (pgt fig. 8), a setose lobe; anteriorly slightly projecting over basal corner of ligula.

Hypopharynx (hyp figs. 8 and 10) membranous, on each side supported by a chitinous rod (hr) which at the entrance to oesophagus is connected with the corresponding rod from epipharynx (er fig. 7).

THORAX:

Tergum of prothorax simple with the different tergal areas very slightly indicated. Prescutal region with a shining yellowish-brown coloration on each side and one seta; scuto-scutellar region with two setæ and alar region without any. Meso- and meta-thorax with tergum divided into two folds or pleads, one formed by the prescutum and the other by the scuto-scutellum and the alar area. Prescutum (psc) with one seta; scuto-scutellum (sc-scl) with one distinct seta and besides with two very small setæ above and one very small seta below this seta; alar area (a) with one minute seta.

Epipleurum (e fig. 2) of prothorax large, triangular, glabrous, situated in front of tergum and above hypopleurum and separated

from this area by the ventro-lateral suture. Questionable if the spiracle carrying area belongs to pro- or to mesothorax; possibly it is a fused region formed by an anterior, spiracle-carrying upper part of the mesothoracic pre-epipleurum and the prothoracic post-epipleurum. Below the spiracle is a small, arched, dorsally concave patch of chitinous granulations. The mesothoracic pre-epipleurum proper (ea) is large, triangular, with one seta. Mesothoracic post-epipleurum (eb) narrow, elongate, situated behind the alar area (a); no seta. The metathoracic pre-epipleurum and post-epipleurum similar to the corresponding mesothoracic areas; anteriorly in upper corner of the metathoracic pre-epipleurum is a rudimentary metathoracic spiracle.

The hypopleural and sternal areas of all the thoracic segments are similar in position, shape and size.

Hypopleurum (hy) situated below the ventro-lateral suture, semioval with the upward curved margin dorsal; one or two fine setæ present.

Presternum wanting in front of each segment; eusternum (est) large, unpaired, triangular; with one minute seta on each side. Prothoracic eusternum with a squarish large patch of chitinous granulations. Parasternum (or coxal lobe) (cx), representing the leg, triangular with rounded swelling below hypopleurum; four or five either normal or small setæ present. Poststernellum (post) transversal, bandlike, with small median pit; glabrous.

ABDOMEN:

The first eight abdominal segments almost identical in every respect; the two last segments somewhat modified and reduced in size.

Tergum divided into prescutum (psc), scutum (sc), scutellum (scl) and postscutellum (cu¹) which later is fused with or entirely constituting the upper cuneus of the intersegmental region. The ventral portions of the scutal and scutellar areas are fused together and form a spiracle bearing region which corresponds to the alar area (a) of the meso- and metathoracic segments. Prescutum (psc) with one fine seta; scutum proper (sc) without any; scutellum proper (scl) with two setæ; the ventral subdivision of scutum and ventral subdivision of scutellum carry each one min-

ute seta; postscutellum (cu^1) glabrous.

Epipleurum (e) ventrally limited by the ventro-lateral suture; median region or epipleural lobe with one seta; anterior or pre-epipleural region glabrous; posterior or post-epipleural region glabrous.

Hypopleurum (h) below the ventro-lateral suture, semioval with one normal and one minute seta.

Presternum wanting. Eusternum (est) subquadrangular, posteriorly transversely swollen; with one minute seta, not found on all segments. Parasternum (or coxal lobe) (cx) triangular; with one minute seta. Sternellum not developed. Poststernellum (cu^2) transverse, bandshaped, glabrous, functioning as articulating skin, forming the lower cuneus of the intersegmental region.

Ninth abdominal segment smaller than the foregoing segments, with areas less distinct; setæ almost normal in arrangement and number.

Tenth abdominal segment small, wart shaped, with terminal round anus (an); two well developed setæ and a few minute ones.

Spiracles (fig. 9) bifore, with two rather short airtubes (t); each of these with about five incomplete annuli; spiracular opening circular (o).

Closing apparatus near the spiracle proper; consists of a well developed arm (a^1) and a very short one (a^2), a fleshy (c) and a hard and sharp pleat or valve (s) and a muscle (m) between the arms.

COMMENTS:

In 1920 the present author contributed a description with a plate of the larva of the cornpit weevil *Geræus* (= *Centrinus*) *penicellus* (Herbst)*. This genus belongs according to the characters found in imago to the same tribe, *Centrinides*, as does the *Limnobaris*. The systematic characters of the larvæ of the two genera corroborate this classification; but the larvæ differ noticeably in general habitus.

The principal characters in common for the two genera are the following:

* Journal Econ. Ent., vol. 13, 1920, p. 277-280.

Epicranium with posterior curved ridge (ecc).

Mandible with five apical teeth and the inside of the mandible concave.

Abdominal prescutum, scutum and scutellum all well developed on the mediodorsal side of the body.

Body sparsely beset with setæ. Prescutum with a single seta and scutellum with two or three well developed setæ.

Postscutellum and poststernellum forming a broad or very broad intersegmental region (cu).

Spiracles typically bifore; airtubes with few (about five) annuli; all spiracles located on side of body.

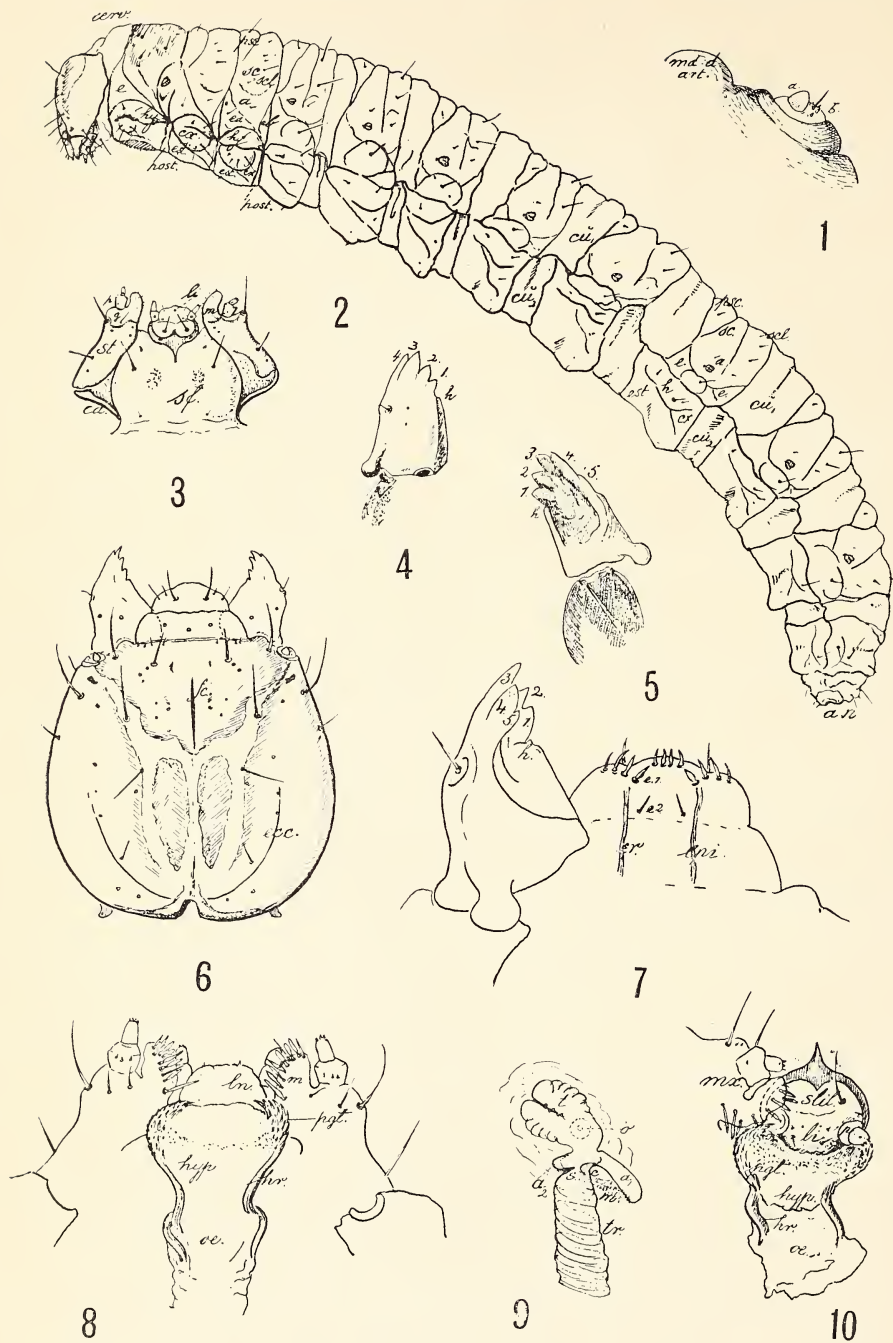
The principal characters separating the two genera are the following:

Head capsule in *Limnobaris* dorsally with a system of broad, whitish bands which form a large figure somewhat like a letter A; in *Geræus* without.

Prothorax in *Limnobaris* with patches of brownish chitinous granulations below the thoracic spiracle, above the footwarts, and medianly on eusternum. In *Geræus* without.

Body of *Limnobaris* comparatively much longer than in *Geræus* due to the much broader intersegmental regions in the former genus.

Eight abdominal spiracle in *Limnobaris* of the same size as the other abdominal spiracles; in *Geræus* somewhat larger and placed more dorsal than the rest.



EXPLANATION OF PLATE XVI.

(All figures refer to *Limnobaris rectirostris* (Le Conte) and are made by the author.)

- Fig. 1. Right antenna: a, apical article; b, basal article; md. d. art., dorsal articulating process for the mandible.
- Fig. 2. Side view of larva:
a, alar area; an, anus; cerv, cervical skin; cu₁, dorsal cuneus (=postscutellum); cu₂, ventral cuneus (=poststernellum); cx, parascutum (=coxal lobe); e, epipleurum; ea, pre-epipleurum; eb, postepipleurum; est, eusternum (=basisternum); h, hypopleurum of abdomen; hy, hypopleurum of thorax; post, poststernellum of thorax; psc, prescutum; sc, scutum; scl, scutellum.
- Fig. 3. Ventral (or subfacial) mouthparts from below: ca, cardo; g, palpiger; li, ligula ventral surface; m, mala (=maxillary lobe); p, maxillary palpus; sf, region formed by fused mentum, submentum and maxillary articulating region; st, stipes.
- Fig. 4. Mandible, lateral exterior face: 1, 2, 3, 4, 5, the five apical teeth; h, projection of inner dorsal margin.
- Fig. 5. Mandible, buccal inner face: explanation as for Fig. 4.
- Fig. 6. Dorsal view of head: ecc, curved ridge of epicranium; fc, dark line corresponding to carina on the interior surface of frons.
- Fig. 7. Epipharynx and mandible from below: 1, 2, 3, 4, 5 and h as in Fig. 4; e₁, anterior pair of epipharyngeal setæ, e₂, posterior pair; epr, epipharynx; er, epipharyngeal rod.
- Fig. 8. Structures on the ventral side of the buccal cavity: hr, hypopharyngeal rod; hyp, hypopharynx; ln, upper or buccal face of ligula; m, maxillary mala; oe, oesophagus; pgt, paragnatha.
- Fig. 9. Spiracle seen from inside with parts facing the cavity of the body: a, long arm of closing apparatus; a₂, short arm of closing apparatus; c, soft fold of apparatus; m, muscle between arms; o, spiracular opening; s, hard fold of apparatus; t, airtube of spiracle; tr, tracheal branch to spiracle.
- Fig. 10. Eulabium bent and stretched out in plane with hypopharynx: hr, hypopharyngeal rod; hyp, hypopharynx; li, ventral face of ligula; mx, ventral face of maxilla; oe, oesophagus; p, labial palp; pgt, paragnatha; stil, stipes of labium.

SOME ENTOMOLOGICAL AND OTHER BIBLIOGRAPHIES.

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"How index-learning turns no student pale,
Yet holds the eel of science by the tail."—POPE.

Bibliography to some is mere drudgery, an ever present and unavoidable evil; to others, however baffling it may be at times, it is an always interesting and fascinating pastime. To all students and workers in every field of interest and research, and especially for all writers, it is an aid and safeguard of extreme importance. The collector of books must study the subject for his guidance and protection while the financial and other success of the bookdealer depends very largely upon his bibliographical equipment. It is said that the largest order for books ever executed was given by Barney Barnato to Selfridges of London—for two copies, printed or typewritten, of every book mentioned in Gibbon's History of the Roman Empire. The list of these citations is an extensive bibliography.

Owing to their great importance as works of reference, bibliographies are perhaps, as a class, the most uniformly valuable of books, in a money sense, when one considers their actual cost of production (exclusive of time!) usually without any expense for plates or other illustrations. Even those relating to the least popular subjects are always in demand and often hard to obtain, being constantly used by their original or present owner, and seldom parted with; they are frequently "reserved" when a library or lot of books is sold.

Of the many general bibliographies, the "Manuel de Libraire" by J. C. Brunet is the one perhaps most often consulted and mentioned. Six volumes of this work were issued, 1860-1865, and two supplementary volumes in 1878 and 1880. The entire set has been reprinted in recent years and the reprint can be had at a moderate price. The earliest bibliographies of natural history known to me are the "Bibliotheca Animalis" by F. C. Bruckmann, a 12mo of 277 pages with an index of (56) pages, published at

Wolfenbittel in 1743, and the "*Bibliotheca Regni Animalis atque Lapidæi*" by L. T. Gronovius, published at Lugduni Batavorum in 1760, the latter a rather imposing quarto of 326 pages. Both are interesting historically, though neither is of practical use at this time. Agassiz's "*Bibliographia Zoologiæ et Geologiæ*", in four octavo volumes, published by the Ray Society of London, 1848-1854, is a well known general catalogue of "all" books, tracts and memoirs on these subjects, many titles of which could have well been omitted. The work is by no means as important as its title and subtitle, and the names of its author and publishers would indicate.

The first great natural history bibliography to appear in the nineteenth century was the "*Bibliotheca Historica Naturalis*" of W. Engelmann, of which the first volume, covering the period 1700-1846, was published in Leipzig in 1846. A "Supplement Band", in two volumes, covering the years 1846-1860 and edited by J. V. Carus and W. Engelmann, appeared in 1861, and the period 1861-1880 is being covered by O. Taschenberg in a second supplementary series, the first signatures of which were published in 1886. To the end of 1923 eight volumes of the Taschenberg series, containing 6,620 pages have appeared, and "the end is not yet". This work is extensive, carefully subdivided and thoroughly indexed, and after a little practice its use is not nearly so complicated as it seems to be at first. It is in fact with but one possible exception the most important of all zoological bibliographies for the period 1700-1880.

Some of the best bibliographies are the catalogues of books contained in libraries of various institutions and societies. At least two of these are of great value in the field of natural history: The "Index Catalogue of the Surgeon General's Library" of the United States War Department, consisting so far of about forty volumes (First Series, 1880-1895, in sixteen volumes; Second Series, 1896-1916, in twenty-one volumes; Third Series begun in 1918), is an index by authors and by subjects of this library (in Washington, D. C.) of over 300,000 bound volumes, about 1,500 serials, and almost 500,000 pamphlets, a great many of which are of interest to entomologists and other naturalists.

By far the best of all natural history bibliographies is the "Catalogue of Books, Manuscripts, Maps and Drawings in the British Museum [Natural History]", in five quarto volumes, issued 1903-1915, and supplementary volume six (A-1) issued 1922, the six volumes containing in all some 3,000 pages closely but clearly printed in double column, chock-full of important facts and details as to plates, pagination, etc., where many of these library catalogues merely cite the date and place of publication and the size of the volume. Words fail to express the great worth of this excellent bibliography.

Some of the large libraries publish card indexes of their books on various subjects. The Library of Congress does, and so does The John Crerar Library of Chicago. These cards may be conveniently used as a nucleus for the worker's own detailed bibliographical card catalogue. Although the unit price of these cards is very reasonable, the vast number of titles makes the total cost on any subject quite considerable.

The Index Catalogue of Medical and Veterinary Zoology by C. W. Stiles and Albert Hassall is a valuable bibliography, by authors, published 1902-1910 in thirty-six parts, with 2,766 pages, as Bulletin 39 of the Bureau of Animal Industry, United States Department of Agriculture. Another very important bibliography is the "Catalogue of Scientific Papers" issued 1800-1900, published by the Royal Society of London, 1867 to date, in eighteen quarto volumes, the last one published (1923) finishing letter S of the Fourth Series.

There are at least three valuable bibliographies of serial publications: Scudder's "Catalogue of Scientific Serials (1633-1876)" issued as Special Publication Number One (1879) of the library of Harvard University; H. C. Bolton's "Catalogue of Scientific and Technical Periodicals" (1665-1895) published (second edition, 1897) by the Smithsonian Institution; and the "Handbook of Learned Societies and Institutions in America", this last being Publication 39 (1908) of the Carnegie Institution of Washington. In June, 1923, the London book dealers, Wheldon and Wesley, issued a priced catalogue (New Series, Number 7) which is a complete list of the many titles on natural history published by

the British Museum down to that time. Similarly, in 1911, the Engelmann house, the great German publishers of scientific works, issued a "Jubiläums Katalog" listing all of its own publications during its existence of one hundred years, with a lot of valuable information about them.

Beginning 1835, the "Archiv für Naturgeschichte" has one volume each year giving the titles of the publications of that year relating to natural history (1835-1911; "Zweiter Band, Bericht über die Leistungen im Gebiete der Naturgeschichte". 1912 to date; "Abteilung B. Jahres-Berichte"). This work and the similar "Zoological Record" issued annually since 1864 by the Zoological Society of London, both carefully subdivided as to subjects, give not only a very complete list of titles with pagination, etc., but also an exhaustive digest of their combined contents systematically arranged. One must refer constantly to either one or the other, or both, of these records. Of the two, the "Zoological Record" is preferred by most English speaking people, and it is to be hoped that zoologists will give it the support necessary for its continuance. Volume 59, for 1922, is being published and the later volumes are in course of compilation. The Zoological Society of London, though willing to lose as much as £500-a-year on this undertaking, feels that the balance of its cost must be met by other organizations and individuals. The "Insecta" portion is of course by far the most extensive part of the work, and it should be subscribed for by every working entomologist, both professional and amateur.

The "Zoologischer Jahresbericht" of the Zoological Station at Naples, begun in 1879, and edited at first by J. V. Carus, was maintained for several years. In this work under each subject is a list of titles followed by a general resumé of the literature with references to the various titles giving a general idea of each one. This is considered by some to be an ideal bibliographical record. The Zoologischer Anzeiger, 1878 (Volume 1) to 1895, also contains a "Literatur—uebersicht", an annual record of publications, which, beginning 1896, has been continued as "Bibliographia Zoologica", both in book form and also as a card catalogue (part of Concilium Bibliographicum) edited by J. V. Carus and (after-

wards) H. H. Field, giving on cards the same information contained in the "Zoological Record" and "Archiv für Naturgeschichte". Friedlander's "Naturae Novitates", instituted in 1879 by the great German booksellers, is a very useful record of publications as they appear, and the similar "Bibliotheca Historico-Naturalis et Physico-Chemica (et Mathematica)" edited by E. A. Zuchold was issued semi-annually, 1851-1888, being distributed by B. Westermann & Co. of New York City and other foreign booksellers.

Coming to strictly entomological bibliographies we at once think of Hagen's "Bibliotheca Entomologica" published by Engelmann in 1862, a model work in every respect with its great attention to detail and copious index. The inestimable value of this work is being forcibly expressed in a rapidly advancing money value, and it has become so scarce and it is so essential that it will undoubtedly some day be reprinted. Although many additions and corrections have been published by various writers, and although Hagen's own copy in the Museum of Comparative Zoology at Cambridge is literally honeycombed and greatly enlarged with such corrections and additions, the work is marvelously accurate and complete. Those laconic (and *expensive*) words—"Not mentioned by Hagen" and "Not in British Museum Catalogue"—sometimes quoted by the delighted book dealer or bibliophile are eloquent tributes to the surpassing excellence of these two great bibliographies.

It would be interesting to have a complete list of the printed additions and corrections to Hagen's work. Those known to me are "Addenda und Corrigenda", by Dr. K. W. von Dalla Torre, in Entomologische Nachrichten (Vol. 4, 1878, pages 324-330; Vol. 6, 1880, pages 125-129, 137-140, 168-171, 261-267; and Vol. 7, 1881, pages 45-48, 163-170); "Ergänzungen und Nachträge", by Dr. G. Kraatz, in Berliner Entomologische Zeitschrift (Vol. 18, 1874, pages 209-226); "Zusätze und Berichtigungen", by Prof. Dr. H. M. Schmidt-Gäbel, in Deutsches Entomologische Zeitschrift (Vol. 20, 1876, pages 145-160); and "Contributions to Entomological Bibliography up to 1862", by Albert Müller (No. 1 in Transactions Entomological Society of London, 1873, pages

207-217, and Nos. 2 and 3, of 15 and 16 pages respectively, separately published by E. W. Janson, London, also in 1873).

Another valuable and interesting entomological bibliography not so well known and by no means so useful as that of Hagen was published in Paris twenty-five years earlier (1837). This "Bibliographie Entomologique" by A. Percheron is also in two volumes and, although lacking entirely the details of the Hagen work, it contains several interesting features, such as the chronological tables of works on various subjects and the seventy-five-page list of anonymous titles. It is one of the earliest of the modern bibliographies of natural history, antedating the Engelmann and Agassiz general works by about ten years. A still earlier entomological bibliography, seldom seen, is the "Bibliographie Entomologique" by Charles Nodier, published in Paris, "An I" (1801). It is a 16mo of 8 and 24 pages. The author was born in 1783 and there is a note in Hagen that he made a great effort to recall this youthful production. There is a copy of it in the Library of Congress. The "Lexicon der Entomologischen Welt, der Carcinologischen und Arachnologischen", "adressenbuch, etc.," published at Stuttgart, 1846, is a semi-bibliographical work of 144 pages, a sort of an entomological "Who's Who". The author is Johannes Gistel. An unimportant but curious attempt at entomological bibliography, contributed by Dr. Wm. Sharswood of Philadelphia, is the "Bibliographia librorum entomologicorum in America boreali editorum", found in *Linnæa Entomologica*, Vol 13, 1859, pages 333-353, and Vol. 14, 1860, pages 256-264. Another project of Dr. Sharswood—carried out many years later by the Boston Society of Natural History—was the idea of publishing under one cover a collection of the entomological writings of Thaddeus William Harris, and advertising prospectuses of this work appeared in various entomological journals of the period.

The Catalogue of the Library of the Entomological Society of London (1893, 312 pages) with the Supplementary Catalogue (1900, 147 pages) does not profess to be anything more than a catalogue, but it cites very faithfully the name of the serial, with the date and volume number, in which a great many papers ap-

peared. A very valuable entomological bibliography published in our own country is the "Catalogue of Publications relating to Entomology in the Library of the United States Department of Agriculture" (Bulletin 55 of the Library, U. S. D. A.) prepared under the direction of the librarian, Josephine A. Clark, and published in 1906. This is a volume of 562 pages, and gives under each title full and exact details of size, pagination, method and place of publication, and numerous remarks and annotations. The titles are given in many sub-divisions, including an arrangement by families under each order, with a complete author index and index by families, each index including *all* the titles under one alphabet.

Our government, especially through the Bureau of Entomology of the Department of Agriculture, has published not only many entomological books and papers, but also several valuable entomological bibliographies. In addition to the one just mentioned there is, first and foremost, the "Bibliography of American Economic Entomology" prepared by Samuel Henshaw and Nathan Banks and published, 1889-1905, in eight parts, with 1,318 pages. This work, now thoroughly "out of print", has been continued by the American Association of Economic Entomologists in its "Index" volumes covering (I, by Nathan Banks) the years 1905-1914, and (II, by Miss Mabel Colcord) the years 1915-1919. These later "Index" volumes are arranged according to species of insects and not by authors' names.

Bulletin 19 (1888) and New Series, Bulletins 24 (1900) and 81 (1910) of the Bureau of Entomology are three editions of a "List of Publications relating to the Entomology of North America". The first of these is by Dr. E. A. Schwarz, who has always been, and still is, one of our best informed authorities on the bibliography of entomology. The later editions were prepared by Nathan Banks. Circular 76, New Series, of the Bureau of Entomology, gives a list of the publications of the Bureau revised to February 1st, 1910. Miss Colcord has brought this list down to date, but her manuscript has not yet been published. In the Proceedings of the Entomological Society of Washington, Vol. 25, No. 1 (January, 1923) my friend Joe S. Wade gives a very useful collation and

check-list of all the various serial and other government publications of entomological interest.

Such works as the Aldrich "Catalogue of North American Diptera" (1905), faithfully modeled after the second edition (1878) of the Osten Sacken catalogue, the Van Duzee "Catalogue of Hemiptera of North America" (1917), the Leng "Catalogue of the Coleoptera of America, North of Mexico" (1920), and the monumental *Catalogus Hymenopterorum* by K. W. von Dalla Torre (in ten volumes, 1892-1902), are of course primarily bibliographical works. The Aldrich Catalogue, for example, contains an annotated list of titles occupying some seventy pages, while the Leng Catalogue has a separate bibliography of over 4,000 titles (pages 367-444). Two American entomological bibliographies are expected to appear during the coming year: an annotated bibliography of works relating to the Hemiptera-Heteroptera of North America, by Prof. H. M. Parshley, of Smith College; and Prof. Z. P. Metcalf's bibliography of works relating to North American Hemiptera-Homoptera.

Nearly every comprehensive entomological book of real merit contains a lot of bibliography. Even the early naturalists did not neglect to give due credit to the works of their predecessors and contemporaries: e. g., Linné in the first edition (1746) of his "Fauna Suecica" mentions forty books on insects. There is to be sure one notorious exception to this custom in the case of J. C. Schaeffer, who in his "Elementa Entomologica" (1766) and the appendix thereto (1777) fails to mention the name or work of any other authority. In Lownie's great work on the Blow Fly (1890-1895) there is a bibliography for each chapter. Our own Prof. W. M. Wheeler in his recent book, "The Social Life of Insects", devotes pages 285-355 to an invaluable annotated bibliography.

There is in existence in this country at least one very complete *unpublished* entomological bibliography—the very extensive card catalogue of over 3,900 works on Orthoptera prepared and maintained by A. N. Caudell. Dr. Bequaert has a similar card-index of literature on Hymenoptera and Diptera. There are many other manuscript entomological bibliographies, many of which are

mentioned in publication number 45 of the "Reprint and Circular Series" of the National Research Council.

R. Friedländer and Son, of Berlin, dealers, issued monthly, 1900-1914, an extremely useful "Entomologische Literaturblätter" giving the current publications, including those appearing in the various serials. Beginning 1913 we have had the "Review of Applied Entomology" published monthly by the Imperial Bureau of Entomology, London, in two "Series", "Agricultural" and "Medical". This is far more than a bibliography. It is a digest of the contents of nearly every entomological work of the slightest agricultural or medical interest, so that a great many of the systematic publications are also included. Our own "Entomological News" has in each issue a long classified list of items relating directly or indirectly to our North American fauna. The early volumes of "Psyche" were "strong" on bibliography, but the result was entirely too complicated to be of much use.

It is frequently desirable to know just what titles are contained in important serials. A common feature of German and other entomological serials in years gone by was the "Repertorium" of entomological contents of various periodicals, very often starting with the year 1862 (date of Hagen). In the case of such serials as the "Proceedings of the Academy of Natural Sciences of Philadelphia", the "Proceedings of the United States National Museum", the "Proceedings of the Zoological Society of London", the "Annales de Société Entomologique de France", etc., when obtainable I bind together either the regular "contents" or those printed on the covers, supplying those missing in manuscript. If the "contents" as printed are not to be had, it is often worth while to make up a card catalogue of the contents of the various volumes. Biographies and obituary notices of distinguished entomologists are not to be overlooked in the search for bibliographical information. They are among the most valuable "sources".

A few insects of great economic importance, such as the silkworm and the honey bee, have such an extensive bibliography that it is practically impossible for it to be included in general works. The French government undertook the publication of a bibliography of literature relating to the "Phylloxera", but found

it to be so extensive that after a few volumes the work was abandoned.

There should be mentioned finally, as very often of extremely great bibliographical value, the regular priced catalogues issued by certain book dealers, notably those of the type originating I believe in Germany cataloging not only the important books, but also thousands of brief pamphlets and excerpts, giving in some cases the details of pagination, etc., and the entirely different catalogues of the English house of Quaritch—the greatest of all book dealers—whose catalogues, besides giving an absolutely accurate description of the books which they offer for sale, are always overflowing with important and fundamental facts relating to them. The 1881 Quaritch catalogue, issued in many sections, and printed both in octavo and in quarto size, is an early example of these wonderful catalogues which continue always to improve, and which are thoroughly satisfying works of reference both for the bibliophile and for other dealers. They are indeed models for the inspiration and emulation of the latter, and may well be studied and followed by all in the preparation and study of bibliographies.

MELANOPLUS DIFFERENTIALIS (THOMAS) A NEW GRASSHOPPER TO THE STATE OF NEW YORK.

On August 30, 1924, a male of this species was found in the salt meadow among rank vegetation near Old Place on the north shore of Staten Island. The first specimens to be reported from the eastern United States appear to have come from cranberry bogs in New Jersey and are mentioned in the second "List of the Insects of New Jersey" by Prof. J. B. Smith. In the vicinity of Philadelphia others were found by Wenzel, Kemp and Seiss in 1896. (See notes on this species by James A. G. Rehn in the Canadian Entomologist for January, 1900.) In 1908 *differentialis* was collected near Dennisville in southern New Jersey by the writer, and later it was taken at the same locality by Dr. Henry Fox. It is a very common species over most of the western states where it is sometimes destructive. It appears to be spreading along the Atlantic coast both to the north and south of Philadelphia.

WM. T. DAVIS.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL
SOCIETY

MEETING OF DECEMBER 4, 1923

A regular meeting of the New York Entomological Society was held in the American Museum of Natural History at 8 P. M. on December 4, 1923, President Harry B. Weiss in the chair with 14 members and five visitors present.

The following new members were elected:

Dr. Philip H. Garman, Conn. Agricultural Experiment Station, New Haven, Conn.

Prof. G. C. Crampton, Mass., Agricultural College, Amherst, Mass.

Mrs. Emilia V. Armstrong, 540 West 112th St., New York City.

Mr. Davis presented photographs he had taken of Mrs. Annie Trumbull Slosson in her home on November 20, 1923.

It was announced that the entomological collections of the late Edgar L. Dickerson had been presented to the American Museum through Mr. Weiss.

Mr. Nicolay gave an interesting account of the numerous collecting trips he had made during the year with various companions including Messrs. Quirsfeld, Shoemaker, Notman, Barber, and Mr. Mason of Philadelphia. He spoke of the Canarsie locality for *Elaphrus fuliginosus* being nearly ruined by building operations, of the western side of Greenwood Lake as affording in its craggy forest of pines and deciduous trees excellent collecting, of the swamp near Orangeburg station on the West Shore R. R., as a locality for *Elaphrus cicatricosus* and many weevils. Other localities visited were Rosedale, L. I., Washington, D. C., Montclair and Roselle, N. J., and the banks of the Wissahicken near Philadelphia, the most northern locality for *Sphaeroderus stenostomus*. Mr. Nicolay's remarks were illustrated by a large collection of weevils made during these trips, and by many references to other species of beetles he had found.

Mr. Leng spoke of "The Genus *Serica* and the work of Mr. R. W. Dawson therein", illustrated by his own collection as arranged by Mr. Dawson with the genitalia extracted and prepared for study. The genus included only four species when Dr. Leconte studied it between 1850 and 1856. This number was increased to 15 by Leconte and to 22 by subsequent authors; which number has again been doubled by Mr. Dawson's descriptions published in our Journal. The patient industry and skill exhibited in the plates published and in the specimens (which are deposited in the American Museum and the public museum on Staten Island) are admirable; but the identification of *Serica* species will not in future be an easy task.

Mr. Davis exhibited a living specimen of *Cychnus viduus* found November 30 near Bull's Head, Staten Island, by Mr. Edward J. Burns and him-

self and remarked that the locality was a forested area protected from fire by a bend in the swamp ditch and that the specimen shown was the first seen since about 1890. Mr. Davis also read an interesting letter from Charles Dury, now 76 years old, describing former localities for *Cychnus* near Cincinnati; and exhibited Circular No. 68, N. J. Department of Agriculture, on the Chinese Mantis by Mr. Weiss.

MEETING OF DECEMBER 18, 1923

A regular meeting of the New York Entomological Society was held at 8 P. M. on December 18, 1923, in the American Museum of Natural History, President Harry B. Weiss in the chair with 18 members and one visitor present.

The following new members were elected:

Alex. D. MacGillivray, 603 West Michigan Ave., Urbana, Ill.

Wm. F. Lawler, Jr., 39 Lincoln Park, Newark, N. J.

Caryl Haskins, 4 Elk St., Albany, N. Y.

Mr. Jones read a paper "Psychid Discoveries and Re-discoveries", illustrated by four boxes of specimens of the moths and their larval cases, which will be published later. After reviewing the status of the 31 species that have been described, some from the larval case only, others from uniques, and pointing out that 25 were represented either in his own or the museum collection, he described the efforts he had made between September 8 and October 31 to trace the species that were inadequately known. The results were already gratifying and especially in regard to *carbonaria*, originally described from Bosque Co., Texas, definitely. He then considered the life history, pointing out that common as the bag worm is, the exact method of fertilization of the eggs is unknown. He described several studies he had made indicating a possibility of fertilization being effected after the egg mass, consisting of moist, tender, thin shelled eggs, had been deposited.

His remarks were followed with great interest and were discussed by Messrs. Weiss, Sturtevant and Lutz.

Mr. Weiss spoke of "Progress of Third Year's Work against the Gipsy Moth in New Jersey", stating that by the expenditure of \$750,000 in the three years the outlook was encouraging for an effective control in the level country. About 400 men had been employed in scouting for colonies of egg masses, the number found having diminished from 855 in the first year to 98 in the third, in creosoting the egg masses found, and in spraying and banding the trees. Thus far in the fourth year's work only 25 colonies had been found, but as some of these were in the heavily wooded Watchung Mts. where effective scouting was more difficult, he was not free from anxiety. The incidental damage to farm animals, unduly magnified and even falsified, was also at times a troublesome matter, of which Mr. Weiss gave some remarkable instances.

Mr. Angell exhibited specimens of *Cychnus hemphilli*, recently received from Utah, and of artificial insects.

Mr. Davis referred briefly to the Morrison prize awarded to Dr. Lutz.

MEETING OF JANUARY 15, 1924

The annual meeting of the New York Entomological Society was held at 8 P. M., on January 15, 1924, in the American Museum of Natural History, President Harry B. Weiss in the chair, with 19 members and six visitors present.

The Curator reported the use being made by Boy Scouts of the local collection.

The Nominating Committee reported their selection of the following officers and committees for 1924. There being no other nominations the Secretary, as instructed by motion duly seconded and carried, cast an affirmative ballot thereby electing:

President—Harry B. Weiss.

Vice-President—Frank E. Lutz.

Secretary—Charles W. Leng.

Treasurer—William T. Davis.

Librarian—Frank E. Watson.

Curator—A. J. Mutchler.

Executive Committee—H. G. Barber, George P. Engelhardt, G. C. Hall, A. H. Sturtevant and L. B. Woodruff.

Publication Committee—F. E. Lutz, Howard Notman, C. E. Olsen and J. D. Sherman, Jr.

The Secretary reported the death on December 23, 1923, of Mr. Edwin A. Bischoff and was instructed to prepare a resolution of regret and sympathy to be entered on the minutes and sent to Mr. Bischoff's wife and family.

WHEREAS the New York Entomological Society has learned with sorrow of the death on December twenty-third, nineteen hundred and twenty-three, of Edwin A. Bischoff, long an esteemed member of the Society and a coleopterist of repute, be it

RESOLVED that this expression of the Society's appreciation of his work in entomology and the Society's regret at his early death be entered upon the minutes, and

RESOLVED that a copy hereof be sent with the sympathy of the Society to his wife and family.

Dr. George Child, American Museum of Natural History, was elected a member of the Society.

Dr. Lutz presented under the title "Notes on the Comparative Anatomy of Bees" an elaborate paper, illustrated by many drawings and tables, in which the wing venation first and the mouth and other structural parts

second were considered for Meloponidæ and Trigonidæ; concluding with a discussion of the results from various points of view.

His remarks were followed with interest and were discussed by Dr. Sturtevant and others.

Mr. Leng read a humorous composition by Mr. Percy L. Sperr entitled "The Man of Science, Meet Him Again Please," in which some of the events recounted at a recent meeting and others were recalled.

Dr. Lutz exhibited for Mr. Bell a queen hornet found January 7, 1924, at Flushing, L. I.

NOTES ON ASILUS SERICEUS SAY (DIPTERA, ASILIDAE).

This robber fly, generally common enough, seemed to occur in more than usual numbers during the summer of 1924 and the writer was interested in observing its attacks upon insects of several orders. It is apparently one of the most voracious of its kind and is powerful enough to grasp and kill butterflies larger than itself. During the many instances this species was observed pursuing and capturing its prey, it was noted that so long as the pursued did not fly, it was apparently safe and although it might walk around on a flower or some other object in plain view of the robber fly, no attempt was made to capture it until it took wing and then it was quickly seized and killed. Sometimes the intended victim would be aware of the pursuit and would drop into the vegetation, thus escaping, but this evasion did not always work for if the robber fly was close it also would dart into the vegetation and sometimes succeed in making a capture.

The writer was chiefly interested in those instances where *Hesperidæ* were captured, and among the several species of this family of butterflies found in the grasp of *sericeus*, was one specimen of *Epargyreus tityrus* Fabricius, which made a heavy load for the fly to carry. In this case it was unable to go very far with it at a time. Even this robust and swift butterfly does not always escape.

E. L. BELL.

THE ACIDITIES WITHIN THE ALIMENTARY TRACTS OF INSECTS.

Of late entomologists and zoologists are giving increasing attention to the acidities and alkalinities within the alimentary tracts of insects in view of the possible bearing of such conditions on the solubilities of poisons, development of intestinal parasites, etc. Such acidities and also alkalinities are expressed as hydrogen ion (pH) concentrations by readings of a scale in which pH 7 is considered as the neutral point; the lower the figure, the greater the acidity. The hydrogen ion concentration may be determined by an electrical method or by means of colorimetric comparisons with a set of colored standard solutions whose pH values are known.

To mention only two recent papers on this subject, Dr. W. J. Crozier, writing in the "Journal of General Physiology" (vol. VI, No. 3, pp. 289-293), finds that in the larvæ of *Psychoda* and *Chironomus* (Diptera) "The ingested food is subjected first to a faintly alkaline salivary juice, passes then through a distinctly acid cardiac chamber, thence to a no less distinctly alkaline portion of the gut" (mesenteron) wherein the food passes most slowly and absorption is most active. He states that in the larvæ studied the hindgut is probably of minor importance in digestion and absorption and that its acidity is due to the discharge from the malpighian tubules. Dr. Crozier gives the typical hydrogen ion concentrations within the regions of the digestive tract as follows: œsophagus 7.1; cardiac chamber 6.2; mesenteron (stomach) 7.5; hindgut 6.4.

Mr. Harrison M. Tietz in the "Journal of Economic Entomology" (vol. 17, No. 4, pp. 471-477) reports that the hydrogen ion concentrations in the alimentary tract of the honeybee are as follows: œsophagus 7.0 (?) ; stomach plus the honey stomach 5.6 and intestine 7.4. He also found that the solubility of arsenate of lead "does not seem to increase when the powder is acted upon by the fluids in the œsophagus" and that the secretions of the honey stomach and stomach render the arsenate of lead at least one and one-quarter times as soluble and the action of the intestinal juices, at least three and three-quarters times as soluble as it would be in water alone.

Ed.

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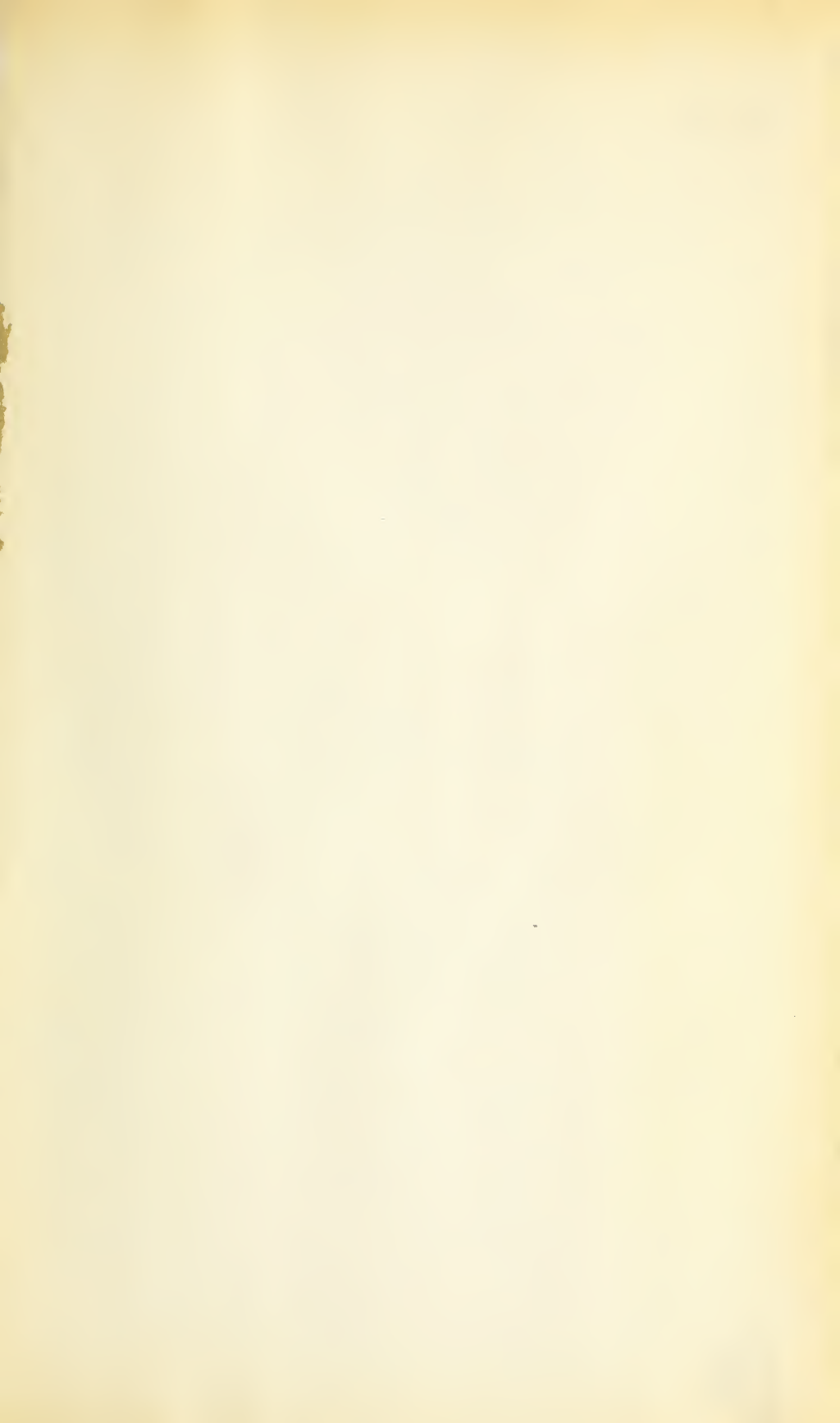
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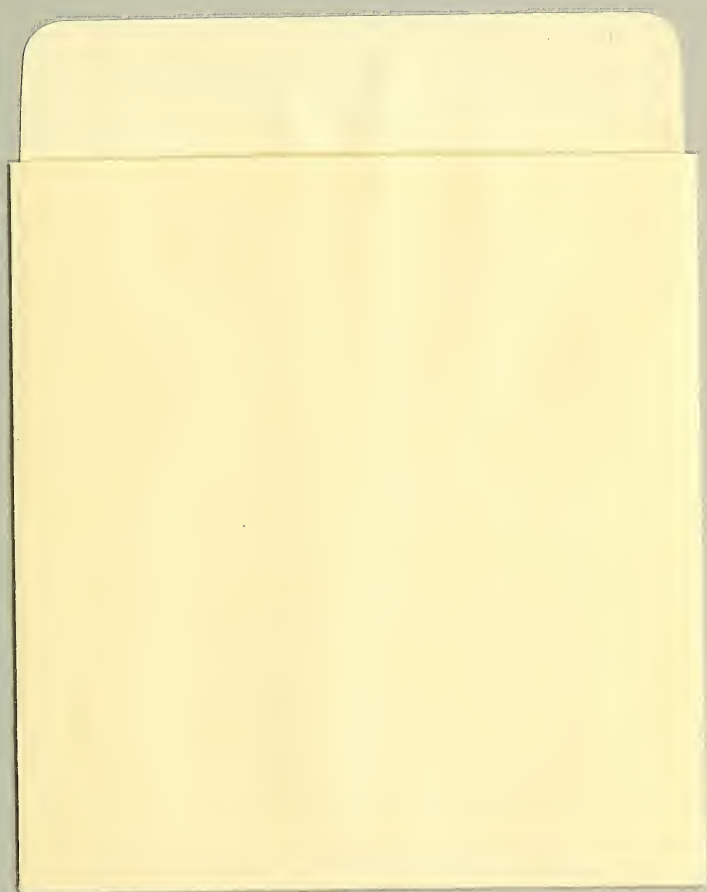
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